BLOSSOMS

SEA SHELLS

These two beautiful pictures were painted by Albert Moore, the British artist whose decorative pictures are famous. "Blossoms" hangs in the National Gallery of British Art, and "Sea Shells" is reproduced here from a photograph by Caswall Smith.

The Book of Knowledge

The Children's Encyclopædia

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CONTENTS OF THIS VOLUME

This is a short guide only to the principal contents of this volume. It is not possible to give the titles of all the Poems and Rhymes, Legends, Problems, colour pages, questions in the Wonder Book, and many other things that come into the volume; but in all cases are given the pages where these parts of our book begin. The full list of these things comes into the big index to the whole work.

THE HISTORY OF CANADA

IN an earlier volume you had a description of this great country of North America with a short account of its history. More of the history was given you in the BOOK OF THE UNITED STATES in volumes two, three, and four. Now you are to learn still more of this wonderful country. You are told of the early settlers, and of their struggles and their trials. You will find that England and France for a hundred years and more fought for the possession of the St. Lawrence River, and for the right to take furs and fish. For a time it seemed that France would not only keep the country we now know as Canada, but would take the whole Mississippi Valley as well. Finally, however, the English drove out the French, but not until after a bloody war.

FRENCH CANADA BEFORE THE CONQUEST

By N. A. BRISCO, Ph.D.

KING HENRY VII of England, not wishing to see Spain reap all the profits of conquests in the New World, signed a patent in 1496, in favour of John and Sebastian Cabot, for the discovery and conquest of new lands. The first voyage was made the following spring but it was not until the third, in 1499, that Newfoundland and Labrador were discovered.

CORTEREAL, THE SLAVE TRADER

Portugal also wished to share in the spoils of the New World, so in 1500, Gaspar Cortereal, one of her greatest sea captains, was sent on a voyage of discovery. He landed on the coast of Labrador and seized a number of natives, whom he took back and sold as slaves.

THE FIRST FRENCHMEN

The first Frenchmen to visit America were not ambitious explorers or seekers after gold. They were simple seafaring Norman and Breton fishermen who came to gather a harvest of fish from the teeming cod banks of Newfoundland. We have proof that these hardy fishermen visited the fishing banks shortly after Columbus discovered America.

VERRAZANO, THE FLORENTINE

King Francis I of France was not satisfied with the modest spoils of his fishermen. He had his ambitions aroused by the great claims of Spain and Portugal in the New World. In 1523, he sent out an expedition under Verrazano. This explorer discovered Florida and sailed along the American coast to Maine. He took formal possession of the country for his royal master and called it La Nouvelle France. King Francis was so well pleased with the success of the expedition that he fitted out another. But no tidings were ever received from Verrazano or from any of his men.

JACQUES CARTIER, THE MASTER PILOT

On account of troubles at home, it was ten years before King Francis could again turn his attention to America. In 1534, he gave his assent to the equipment of an expedition. Its command was given to Jacques Cartier of St. Malo, a hardy mariner who had often visited the fishing banks of Newfoundland.

In the early summer, Cartier sailed from St. Malo with two small vessels and a crew of one hundred and twenty men. Twenty days later, the coast of Newfoundland was reached and the tiny barks passed through the Straits of Belle Isle into the Gulf of St. Lawrence. Circling round, they passed close to the New Brunswick shore. In July, they entered the Bay of Chaleurs

and Cartier landed on its coast at Gaspé. He took formal possession of the country in the name of the French king and erected a huge wooden cross as a sign of French sovereignty. On the 25th of July, he sailed for France, taking with him two natives whom he had kidnapped while at Gaspé.

CARTIER DISCOVERS "CANADA"

The following May, Cartier embarked again for the New World. On the tenth of August his ships sailed up the St. Lawrence, so called because it was discovered on the feast day of the saint bearing that name. Guided by two savages, he sailed up the river to an island, since named Isle d'Orleans. His native guides told him that the country was divided into three districts — Hochelaga, Canada and Saguenay. Here first we meet the name now borne by the Dominion. It is a word of Iroquois origin, meaning in the native tongue a collection of Indian dwellings.

CARTIER DISCOVERS MONT ROYAL

Above the island and nestling at the foot of a mighty rock on which the citadel of Quebec now stands was the little Indian village of Stadacona. The natives, who had never before seen a white man, were very friendly. They warned Cartier against the terrors of a journey up the stream to the town of Hochelaga. Cartier turned a deaf ear to their counsels and set out with fifty sailors for the west. They rowed up the mysterious river till they reached the first hill of any size that they had seen since leaving Stadacona. This mountain, Cartier called Mont Royal. Its wooded crest now towers above the City of Montreal. Along the shore, sheltered from the northern blasts, was the town of Hochelaga. It was composed of about fifty tunnel-like dwellings and surrounded by a strong wall of logs.

The bearded white men with their resounding trumpets were received with a mixture of awe and delight. They were thought to have come from heaven. The half-naked Indians brought all their sick to be healed. On leaving Cartier was showered with gifts of fish and corn.

THE HORRORS OF THAT CANADIAN WINTER

Cartier returned to Stadacona and resolved to pass the winter in Canada. His men built a rude fort and surrounded it with palisades. In December, scurvy of a violent nature broke out among the French. Of the one hundred and ten men, for some time, not more than three or four were free from the disease. Twenty-six men died before April. Most of the others were at death's door, when an Indian gave Cartier a native medicine which cured the ailing Frenchmen. When spring returned, they departed for France. Chief Donnacona and several of his tribe were treacherously seized and taken along for presentation to the French king.

THE FIRST SETTLEMENT

On arriving home, Cartier found his country distracted by religious dissensions and in war against Charles V. Amid such troubles, he found his presence unheeded and his projects disregarded. The existence of Canada seemed now to be ignored by king and country alike.

It was 1540 before Francis I could again listen to proposals concerning Canada. Many of his subjects were opposed to settlements, claiming that the weather was too cold and that gold and silver mines did not exist. However it was finally decided that a profitable trade in furs could be obtained and that it was unwise to allow the other European countries to share the spoils of the New World among them.

The king by royal edict, dated June 15, 1540, gave Seigneur de Roberval the right to raise a body of volunteers to make a permanent settlement in the New World. Cartier was given the command of the vessels for conveying the colonists to America. Cartier with a part of the little squadron sailed early in the summer of 1541. After a three months' stormy voyage he arrived at Newfoundland, where he awaited the arrival of Roberval. He failed to appear, so Cartier continued his voyage, and cast anchor at Quebec. The colonists on landing began to clear land for cultivation. Leaving his men thus employed, he ascended the river, hoping

to get beyond the Sault St. Louis, but found it impossible to clear the falls.

Roberval did not put in an appearance, and Cartier prepared to pass the winter in the country. He sent two of his vessels to St. Malo to inform the king of his work and to inquire what had delayed Roberval.

In the spring, the Indians became unfriendly, and he sailed with all his colonists for home. About the same time, Roberval left France. The two small squadrons met off the shores of Newfoundland. Cartier refused to turn back and continued his homeward voyage.

Roberval sailed on to Stadacona and made preparations for the coming winter. Before spring, fifty of his men had perished. During the summer, the king, instead of sending aid, ordered Cartier to go and bring Roberval back, as his services were needed in the war that was about to be declared. All the survivors were taken back to France, and thus ended the first attempt at colonisation.

The Fur Trade

During the remaining years of the sixteenth century, France was engaged in war and did not have the time to think of New France. The red-skinned Canadians were left undisputed masters of their forests. Yet the Banks of Newfoundland were visited yearly by French fishermen. Some of these fishermen found it profitable to spend part of their time in exchanging gifts with the Indians for furs. These furs were sold at a handsome profit and it was not long before many fishermen devoted their entire time to the fur traffic. It attracted other adventurers, and by the end of the century a somewhat extensive trade in furs had been established.

Settlement at Tadoussac a Failure

Pont-Gravé, a rich merchant of St. Malo, sailed in the early summer of 1599 to establish a trading-post in Canada. Tadoussac, at the mouth of the Saguenay, was chosen. It was a favourite meeting place of many tribes of Indians. Sixteen men were left to hold the place during the winter. In the spring only two survivors were found. They would have perished if they had not been cared for by friendly Indians. Tadoussac became a mere summer trading-post.

Champlain, the Founder of New France

Two years later, a trading company, having secured the fur monopoly, fitted out an expedition for Canada. Captain Samuel Champlain, a distinguished naval officer, was invited to command the expedition. With three vessels he set sail in 1603. Accompanied by Pont-Gravé, he ascended the River St. Lawrence as far as the Sault St. Louis. Upon his return to France, his report so pleased King Henry that he promised to give all possible assistance to building up French interests in Canada.

Acadia Founded

The fur monopoly was now granted to Sieur de Monts. Through his influence it was ordered that all Huguenots were to enjoy religious freedom in the New World.

In March, 1604, de Monts and Champlain sailed with emigrants for Acadia. They passed along the coast and discovered the two rivers, St. John and St. Croix. On an islet at the mouth of the latter de Monts decided to land his colonists. During the winter, thirty-six of his men died from scurvy. As soon as spring arrived, he set out in search for a more suitable place. On his return from a coasting voyage to Cape Cod he found that Pont-Gravé had arrived with forty colonists. This reinforcement raised the spirits of all. They finally chose a new home. A small town was built and named Port Royal. The little colony flourished, but the spring of 1607 brought bad news. De Monts had lost his monopoly and the colonists were forced to abandon Port Royal and return to France. Poutrincourt in 1610 came over to Acadia with a fresh supply of colonists. He found the old buildings still standing and the natives were delighted at the return of the French.

Quebec Founded

Champlain was chosen to settle a colony on the St. Lawrence as a base for further exploration. He left France

in 1608 and reached the spot where Stadacona once stood. The place was destroyed and deserted. Upon this site, Champlain laid the foundation of Quebec, which means a strait.

CHAMPLAIN'S COSTLY BLUNDER

During the year 1609 occurred an event which was the main cause of the prolonged and the bloody conflict between the Iroquois and the French. Champlain took up the cause of the Algonquins and left Quebec with a few Frenchmen and a flotilla of canoes filled with Indians to attack the Iroquois. A vast body of water was discovered, afterwards called Lake Champlain, and upon its shores he met two hundred of the fiercest and bravest Iroquois. The war-whoop of the Indians was met by a discharge from Champlain's matchlock. The superstitious Indians mistook this for lightning and fled. From this time until Canada became an English colony, the powerful Iroquois were always the bitterest enemies of the French.

A WINTER WITH THE INDIANS

In 1613, Champlain with five companions and two canoes paddled up the Ottawa River to Rideau Falls. Two years later, he made another expedition further up the Ottawa, reached Mattawa, crossed by a short portage into Lake Nipissing and then descended the French River into Lake Huron. In September, he led a large party of the Hurons down the River Trent into Lake Ontario. There the Indians made an attack on a well-palisaded town of the Oneida Indians and were repulsed. Champlain was wounded and as a result lost his great prestige.

THE FIRST CODE OF LAWS

In 1621, Champlain issued a number of ordinances for securing peace and order in the colony. This collection forms a kind of code and was the first that Canada possessed.

"COMPANY OF THE HUNDRED PARTNERS"

The colonists devoted almost their entire time to the fur trade. Very little had been done towards clearing the forests and tilling the soil. The great Cardinal Richelieu determined that more attention should be paid to colonisation. In carrying out his plans, he formed a new company of traders under the name of the "Company of the Hundred Partners." He granted to its members the monopoly of trade and the power to govern New France and Florida. The king gave the company two ships and made twelve of its chief members nobles. In return for these privileges, the company promised to send out six thousand settlers during the next fifteen years. Each colonist was to be of French birth and a Catholic. Thus did Canada pass once more from a royal to a commercial regime.

QUEBEC SURRENDERS TO THE ENGLISH

Charles I of England took up the cause of the Huguenots and declared war against France. A fleet of war vessels was equipped in England to invade the settlements of New France and attack Quebec. In the summer of 1628, the English vessels reached the Gulf of St. Lawrence. They captured several French vessels laden with fish and furs. Then, they met and defeated a French fleet sent over by the Hundred Partners with colonists and supplies for Quebec. Kirke, the English commander, satisfied with his success, returned to England. Quebec, deprived of its supplies, had a very hard winter, and when Kirke returned the following spring, surrendered to the English.

QUEBEC GIVEN BACK TO THE FRENCH

During the following three years Quebec was occupied by an English garrison. The soldiers made much profit out of the fur trade with the Indians. The war between England and France was brought to a close by the Treaty of St. Germain-en-Laye (1632). New France and Acadia were given back by England and Champlain was restored to his post.

NEW FRANCE MADE A ROYAL PROVINCE

The history of the country from 1633 to 1663 is but the history of the fur trade, the Jesuit missions and the struggle against the Iroquois. The Company of the Hundred Partners devoted all its

time to the fur trade and paid little heed to colonisation. Because it did not carry out this part of its agreement, the king in 1663 cancelled its charter and New France was made a royal province.

Rivals in Acadia

In 1613, Samuel Argall set out from Virginia with an expedition to drive the French from Acadia. Port Royal was pillaged and the crops in the fields destroyed. As a result of this raid, Great Britain began to press her claims upon Acadia. After 1614, the land which King James of England had granted to the Plymouth Company between the forty-fifth and forty-eighth parallels of latitude was called New England. Having a New England and a New France, Sir William Alexander, a loyal Scotchman, decided there should be a New Scotland. From the king he obtained, in 1621, a grant of the whole of Acadia under the general name of New Scotland or Nova Scotia. Charles I renewed Alexander's charter and later established the Order of Baronets of Nova Scotia. Each member of the order, in return for a pledge to make actual settlements in the colony, received an estate of eighteen square miles. In a short time, a number of estates dotted Nova Scotia. Admiral Kirke, in 1628, declared Acadia to be under the rule of Sir William Alexander's Company. By the treaty of 1632 Acadia was restored to France. The forces of Oliver Cromwell conquered the colony in 1654, but it was restored by his successor.

Civil Government in Canada

Under the new system of royal government, the three most important persons in New France were the governor, the intendant and the bishop. The governor was the official head of the colony and through him all negotiations with the Indian tribes and with the English colonies were conducted. In addition to the governor-general there were local governors at Montreal and Three Rivers. The intendant had charge of justice, police and finances. He may be called the king's business manager for the province. The bishop was the head of the Church. These three, together with a body of councillors, at first five, afterwards seven, and finally twelve, formed the Sovereign Council. The name was afterwards changed to Superior Council. This council was a legislative body and a court of justice. It was bound nevertheless to enforce the edicts of the king. There arose many bitter disputes between the governor-general, the intendant and the council. The king, three thousand miles away, was the only one to decide these disputes, and a strife would frequently last for months.

The Seigneurial System

The system adopted to advance settlement was a mild form of feudalism. The French king desired to create a Canadian noblesse but without the oppressive privileges enjoyed by the same class in Old France. To make up the required number, patents of nobility were from time to time conferred upon men of note in the colony, to whom seigneuries were granted to be held of the Crown upon the tenure of faith and homage. They could receive as tenants all who would settle upon their seigneuries. The seigneurs had the right to settle petty disputes and to punish trifling offences.

Frontenac, the Great Onontio

In 1672 there arrived at Quebec the most famous of all the governors of New France — Louis de Buade, Count de Frontenac, called by the Indians the Great Onontio. He determined to compel the Indians to sell their furs to the French rather than to the English, who were trying to gain a share in the fur trade. Accordingly, in 1673, he built Fort Frontenac where Kingston now stands, to intercept the fur trade, which the English wished to divert to Albany. From 1694, the French settlement continued to increase and aroused the jealousy of the English colonists to the south. Both parties, aided by the Indians, carried on a destructive border warfare.

The Loss of Acadia

In 1703, there broke out in Europe the War of the Spanish Succession. The

renewal of the war soon led to hostilities in America. Several unsuccessful attempts were made by the New Englanders to take Acadia. Finally, in 1710, an expedition under Nicholson was sent on this mission. Port Royal with little resistance was taken, and this meant the capture of Acadia, which thus passed for ever out of the hands of the French. The following year the English under Admiral Walker failed in an attack on Quebec. The Peace of Utrecht (1713) brought peace for a time to America. By its terms, France abandoned all claims to Hudson Bay, Acadia and Newfoundland. She retained Cape Breton, Prince Edward Island and certain fishing privileges on the Banks of Newfoundland.

Louisburg Fortified

During the thirty years peace that followed, the English and the French in America were constantly on the verge of war. The French chose Louisburg as a seat of government and at once commenced to fortify it.

Louisburg Captured

Early in 1744, news reached the New World that war had been declared between England and France. In a few months, the American waters swarmed with French privateers. The New Englanders determined to destroy Louisburg and for that purpose fitted out an expedition. Under the leadership of William Pepperell it left Boston on the last day of March, 1745. Later the expedition joined the English fleet under Admiral Warren and Louisburg was besieged. At the end of seven weeks the town surrendered. Now followed a series of raids and counter-raids. This border warfare was interrupted by the Peace of Aix-la-Chapelle (1748). Cape Breton and the captured fortress of Louisburg, much to the disgust of New England, were restored to France.

General Braddock Fails to Drive the French out of Ohio Valley

The peace was but a truce, hostilities hardly ceasing in America. Beyond the Alleghanies English traders had pushed their way into the Ohio Valley, claimed by the French. The French objected and determined to fortify the Ohio Valley by a line of forts. The English decided to drive their enemies out of the valley. General Braddock, at the head of an English army, was sent to drive the French out of the Ohio Valley. His campaign was a disastrous failure.

Marquis de Montcalm Comes to Canada

Louis XV, on the eve of war in Europe, could spare but few troops, but he sent to command his little army in America one of his bravest soldiers, the Marquis de Montcalm. He arrived in Canada in May, 1756, the same month that war was declared between his country and England. Both sides were very active in preparing for the coming struggle. In August, Montcalm captured Oswego, and followed this up by taking Fort William Henry, but on the other hand the English captured and destroyed Louisburg.

The Fall of Quebec

The British now prepared for a supreme effort to take New France. Amherst was to march upon Montreal while Wolfe was to capture Quebec. Montcalm took vigorous measures for the defence of Quebec. The fleet which bore Wolfe and his men reached the Isle d'Orleans near the end of June. His land force numbered less than nine thousand men while Montcalm had five thousand more. The position of the French was almost impregnable. It was Wolfe's plan at first to tempt his opponent to battle but in this he failed. He decided to stake everything upon scaling the Heights of Abraham. The plan succeeded, and as morning broke on the thirteenth of September, 1759, the British troops stood on the Plains of Abraham and faced the French army. Charging at the head of his grenadiers, Wolfe was fatally wounded and died with the din of victory ringing in his ears. In the rout which followed, Montcalm was wounded, and died the following day. The following year Montreal was captured. This closed the struggle. By the Treaty of Paris (1763) Great Britain was confirmed in her possession and Canada remained a British colony.

Continued on page 3897

The earliest Russians fighting the Scythians, a fierce race of barbarians who lived round the Black Sea.

THE MAKING OF RUSSIA

CONTINUED FROM 3602

EUROPE and Asia, unlike the peninsula and island continents of the world that stand out distinct and alone, are practically parts of one vast mass of land whose western shores are washed by the Atlantic, and the eastern by the Pacific. We can trace one continuous belt of highlands right across Eurasia, as the united continents are often called, from the Alps to the mountains of the peninsula of Kamchatka; and the plain that lies between the White Sea and the Black Sea is continued far into Asia, round the base of the Ural Mountains. These mountains, too, being only about two thousand feet high, form no real barrier between Europe and Asia, either in the matter of climate or vegetation.

In all the stories of the western countries of Europe, we have read of their early inhabitants coming from Central Asia. Wave after wave of different peoples, for hundreds of years, rolled over this plain south of the Urals. They spread, as we have seen, over Europe, led by necessity or choice, to the extreme west, south and north.

But some of all the various peoples and tribes decided to go no farther than the plain between the White and Black Seas, and settled there. Chief among them were the Finns, cousins of those whom we have seen driven north by the Scandinavians in Sweden, and the Slavs, cousins of those who settled between the Adriatic and the Black Sea. And the Slavs pushed the earlier inhabitants, the Finns, farther northwards, exactly as the Teutons did in Scandinavia. Now the chief features of this great plain are its splendid rivers and its great lakes. To the north is Lake Ladoga, the largest lake in Europe, and the land on the Baltic, where the Finns finally settled, has so many lakes that it is often called the Land of a Thousand Lakes. South of Lake Ladoga are the low Valdai Hills, where rises the mighty Volga, the largest river in Europe, that flows with a gentle current all its long course, till it runs into the Caspian Sea by numerous mouths. The Caspian Sea is the largest inland sea in the world.

The Dnieper and the Don, both long and important rivers, find their way across the plain, the Dnieper to the waters of the Black Sea, and the Don to the Sea of Azov. The early tribes settled on the land about these rivers that flowed through wide, treeless plains called steppes, which are, in parts, rich with black earth and very fertile, and in parts covered with grass for pasture land. Sometimes they are desert and rocky. Two of the oldest

towns we know about in these regions are Kiev, on the Dnieper, and Novgorod, or Newtown, just north of the Valdai Hills, easy of access to both the Baltic and the Volga. And here we have the kernel of the country afterwards called Russia.

It was about a thousand years ago, so the old story says, that three bold Viking brothers were invited from Scandinavia to settle and rule in Novgorod. "Our land is great and bountiful," runs the old message, "but there is no order in it. Come and rule over us." This story reminds us of that of Hengist and Horsa settling in Kent, and it may be just about as true. Rurik, the chief of the brothers, in the end, gained sole power in the district, and founded a line of chiefs who gradually merged their Scandinavian nationality in that of the people whom they ruled, just as the Northmen did in France, and the Danes in England. But the old Norse daring showed itself when one of the chiefs hung his shield on the wall of Constantinople, and when nothing short of the terrible Greek fire, like lightning, could dislodge the ships that these adventurous and warlike Vikings brought.

Rurik, the daring Viking, who, with his two brothers, conquered a great part of Russia in the ninth century, and founded a line of princes who ruled Russia for about 700 years.

Towards the end of the tenth century arose Vladimir, the first Christian ruler of the country, though, before his day, Queen Olga went to Constantinople to be baptised, and was called the "forerunner of Christianity in Russia, who shone in the midst of a heathen people." Vladimir also chose to belong to the Eastern, or Greek, Church, and ever since, for over 900 years, his country has kept faithful to that branch of the Church, and, indeed, has been its head since the cathedral of St. Sophia became a mosque, as we read on page 3151.

Through the centuries it has often been able to hold out a helping hand to the smaller Slavonic countries, belonging to the same faith, when they were oppressed by their Mohammedan masters.

Vladimir insisted on his people being baptised in crowds, whether they wished it or not, just as happened under Clovis, as we read on page 2065. He was a conqueror, too, adding both Slavonic and Finnish tribes, especially on the side of Poland. But he had no thought of uniting all as one nation, for, on his death, he divided his kingdom among his sons. One of these is remembered as the first great law-giver of Russia, and, in his code, we find how various crimes were punished by fines, and how trials were settled, as well as many other interesting details of life in Russia in this very early period of its romantic history. For about two centuries there now followed incessant civil wars. The custom of dividing up inheritances among several sons led to endless quarrels. Kiev was desolated by fire, Novgorod by famine. It was a gloomy time, and worse was to follow. In 1224 a new and terrible danger came from without. Once more, hosts from Asia came sweeping westwards over the great plains south of the Urals. As we have seen, there were no mountain fastnesses in which the people could gather to defend themselves against the cruel invaders; the cities were poorly fortified, so there was nothing to stop the onward rush of the host of Mongols or Tartars, who came plundering and destroying all in their path. Novgorod for a long time held its own; it belonged to the Hanseatic League, and had a great trade, and chose its own princes. "Who can contend with God and great Novgorod?" became a proverb that showed its power and independence in those times. But elsewhere the Russian

THE RUSSIAN EMPIRE IN EUROPE

No European country has such varied features as Russia, for it extends, as we see here, from the Arctic Ocean in the extreme north, to Asia in the extreme south, and has almost every kind of climate and physical feature.

The picture on page 3631 was painted by V. Verestchagin.

princes and dukes were obliged to do homage to the Tartars, to furnish soldiers to fight for them, and to pay them heavy taxes. There was no national life at this time; all was depressed. Many strong and large monasteries were built up and down the country, whither people could retire for peace and safety; and to the labours of the monks, who lived in them, we owe the chronicles and the stories that have been handed down, and are of such deep interest to those who study the history of Russia. Some of the old stories are sung to-day, by wandering minstrels, about Vladimir, the "shining sun," and Queen Olga, and many others who helped their country.

THE BURNING OF MOSCOW CENTURIES BEFORE NAPOLEON WAS BORN

Among other cities burnt by the Tartars, more than once, was Moscow, then a small town, but in a famous position on a sub-tributary of the Volga, midway between the White, the Baltic, the Black, and the Caspian Seas. Later, much of the history of the country centred round Moscow, the capital of the Muscovites, as Russians are frequently called.

As time went on the Russian princes and nobles intermarried with the Tartars, and the Russians adopted from them many customs in manner and dress which they had brought from the East. Between Russia and the Baltic in those days were the Lithuanians, who remained heathen till the fourteenth century, and for a time they succeeded in holding some of the West Russian states and cities, including Kiev. Poland was united, too, to Lithuania for a time, and many struggles and quarrels arose, both with each other, and with the neighbouring German states.

PRISONERS WHO WERE ROPED TOGETHER AND DRIVEN LIKE HERDS OF CATTLE

At the close of the fifteenth century the Russian princes succeeded in breaking up the Tartar power. The region on the northern shore of the Black Sea passed under the rule of the Turks, and was, for long, a bone of contention between them and their Russian neighbours, who were longing for ports and ships on this southern sea. Though the Tartars ceased, at this time, to be a terror to the country, their inroads continued for a century longer, and often miserable prisoners, roped together, might be seen passing over the steppes eastwards, driven along with captured herds of sheep and cattle.

We come now to a time when the Russian princes rapidly became stronger, and succeeded in getting more and more power into their own hands. There are two—Ivan III. and Ivan IV.—who stand out in the fifteenth and sixteenth centuries. Ivan III. crushed the liberties of Novgorod, and annexed many cities and states, refused to do homage to the Tartar khan, or ruler, and made alliances with surrounding countries. He married the niece of the last Greek emperor, Constantine, who was slain at the taking of Constantinople by the Turks. Many learned Greeks came in the train of the princess, bringing with them valuable manuscripts. These found safe housing in the monasteries, that were ever growing stronger and richer.

Moscow was rebuilt, and progress was made in many ways. This Ivan III., called the Great, is considered to be the founder of the state of modern Russia.

THE TRAVELLERS TO RUSSIA WHO SALUTED A DYING BOY KING

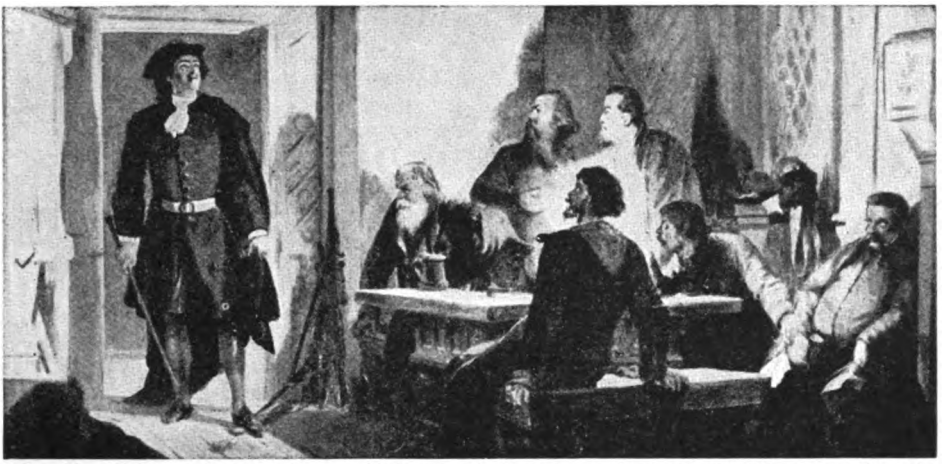
From this time the double-headed black eagle, used by the Greek Empire, was adopted as the arms of Russia, and the title of tsar, or czar, by many thought to be derived from Cæsar, was assumed by her kings.

It was Ivan IV., a man of great power, though at times so insanely cruel that he is called the Terrible, who formally took the title of czar in 1547, after annexing many cities and states on the great plain, till his dominions reached to the south as far as Astrakhan, on the Caspian, and also to the north as far as the White Sea and Siberia.

So Russia began to spread into Asia, and, reaching the White Sea, it at last had a chance of trading with distant countries, even though its port was ice-bound for a great part of the year.

We read, on page 845, in the story of England, how the dying boy king, Edward VI., was saluted by the ships of Chancellor and his companions as they sailed past his windows at Greenwich, on their way to the White Sea to open up trade with Russia. They had a very hearty welcome, for Ivan was anxious to trade, anxious to have workmen come to his country from the west; and the king

THE GREAT CZAR PETER, MAKER OF RUSSIA



When Peter the Great determined to travel in Europe, the Streltsi, a regiment of pampered and bigoted guards, conspired to take his life; but Peter discovered the plot, and visited the conspirators unarmed, as seen here.

In this picture, we see Peter the Great, as a child, with his teacher. But while he was quite young, the teacher was removed, and Peter wasted all his time at play.

Peter the Great was very fond of the sea, and had almost a mania for ship-building. Here we see him standing in a small boat upon the sea in a fierce tempest.

Peter went to England and lived for a time at Deptford, where he dressed as an ordinary workman and studied ship-building in all its branches. During his stay on the Thames, King William III. visited Peter, as shown here.

of Poland, being his bitter enemy, would allow no passage through his dominions. Chancellor made his way from Archangel to Moscow to display his wares, and, in spite of a most disastrous voyage home, the desired communication was opened up by way of the Arctic Ocean and a Russian ambassador and his suite, in gorgeous coats of velvet, with fringes of silk and chains of gold, made a splendid entry into London within two years of Edward's death.

Thus began much trade between Russia and England. Queen Elizabeth always wished to be on good terms with Russia, though she declined to marry Ivan. He could not understand her position towards her subjects, telling her that it was they who governed her, so limited was her authority. He considered that the lives of his people were his own property, and he put them to death whenever he pleased. When he died the empire was not only greatly enlarged, but it was in a better state of defence than it had ever been.

THE TYRANT RULERS WHO ENSLAVED A WHOLE NATION

It was left to the reign of Boris, a powerful noble of Tartar descent, to complete the enslavement of the Russian peasants, which had been gradually growing for several reigns. In 1597 a decree was made, forbidding peasants, or serfs, as they were called, to leave the lands and estates on which they lived.

A miserable time of civil wars followed, chiefly on account of pretenders to the throne, and the country became a prey to its enemies. The Poles found their way to Moscow, in fact, there was a Polish czar for two years; and when they were driven out, the city suffered greatly. When differences arose with Sweden, Gustavus Adolphus was able to carry a treaty through, which completely shut out the Russians from the Baltic. "We will hope," said Gustavus to his council, "that the Baltic will always prove too wide a jump for them."

An attempt to limit the power of the Crown was made when Michael, the first of the Romanoff line, was proclaimed Czar of all the Russias; and there were many difficulties with the Boyars, as the nobles were called, also with the Cossacks. The Cossacks were adventurous robbers who were of a mixed race, living in the south of Russia and Poland, the two chief tribes being those who lived on the Don and the Dnieper. They owed a nominal subjection to the Russians and to the Poles, and were organised into regiments, to serve as an advance guard to resist the Tartars and Turks. The Poles treated the Cossacks with great severity; and in the end they all owned Russia as chief over-lord, but they have always been very restless and difficult subjects.

THE BOY WHO BECAME CZAR AND GAVE HIS COUNTRY NEW LIFE

It was a Cossack who conquered a large part of Siberia, which was much visited by traders for its valuable furs, and presented it to Ivan the Terrible.

Towards the end of the seventeenth century, the direction of the affairs of Russia fell into the hands of a lad of seventeen. This was Peter the Great. He is said to have given new life to his country, so greatly did its fortunes change under his rule.

As a child he observed everything, and was fond of boats and engineering, and, as soon as he had a chance, he left Russia to go on his travels, and learn all he could from other nations. The Czar of Russia to-day owns a little hut, at Zaandam, in Holland, where Peter lived when he worked in the dockyard, and gained a certificate of efficiency in various handicrafts, which is still preserved.

Then he went to England, and lived at Deptford. There are only a few remains left of the house in which he lived, and at which he did a great deal of damage to the locks and grass lawn and holly hedges; but the street leading to it is still called after the Czar Peter. William III., of England, ordered a sham sea-fight at Spithead to amuse his royal visitor. The fruit of Peter's labours in the dockyards was the foundation of a navy for Russia; and in time Peter gained entrance to a western sea on which to float it.

PETER THE GREAT AND HIS WARS WITH THE LAST OF THE VIKINGS

We have seen how anxious Ivan IV. was to reach the Baltic, and how Sweden managed to secure the lands that bordered it. Charles XII., who is sometimes called the last of the Vikings, gained, as we see on page 3596, some brilliant victories over Peter and the King of Poland, in defence of the

THE COSSACKS IN THE OLDEN DAYS

The subjection of the peasant classes to the nobles lasted longer in Russia than in any other European country, and here we see peasants bringing bread and salt to their feudal lords, 200 years ago, in token of subjection.

The Cossacks, who wandered about Eastern Russia, were for many centuries independent. Here we see them sending an insulting reply to the Sultan Mohammed IV., who claimed sovereignty over them about 1670.

The bitter oppression in Catherine the Great's reign, led to an insurrection in Eastern Russia, in which a Cossack, named Pugatchev, shown in this picture, became leader, and pretended to be the dead czar, Peter III.

disputed territory; but at last Peter gained control of the river Neva, that flows into the Baltic by the Gulf of Finland. Peter renamed the place at its mouth, which had once belonged to Novgorod the Great, Schlüsselburg, from the German *Schlüssel*, a key; he also gave a German name to the fort, Kronstadt; and to the new capital, St. Petersburg, that he created to help to Russianise the long-desired Baltic.

THE NEW CAPITAL OF A GREAT EMPIRE THAT IS BUILT UPON A SWAMP

He lost no time in starting the foundations of his new city. It had to be built on piles, the site consisting of swampy islands on the Neva. Thousands of workmen were brought from their homes to build churches and fortresses, palaces and houses, of every kind.

But Peter was not only a builder; he was a great reformer. He made new regulations for the government of the Church, altered the customs of society, forbade all Eastern habits brought in by the Tartars, insisted on people shaving, and did all in his power to make Russia like Western Europe. When he went for his second tour, he visited France; and, hating pomp, he refused the Louvre as his place of residence. It is told how he held the little king, Louis XV., in his arms. He built canals, had books translated, founded libraries and museums, and travelled with unflagging energy all over his dominions. We shall find many traces of his visits when we read the story of Russia of to-day.

Peter's ambitions were not confined to the western sea. He took a most important step when he seized Baku, on the Caspian Sea, for here are the wonderful oil-wells that to-day bring much wealth into Russia; also the Caspian Sea has proved very useful as a thoroughfare.

HOW WOMEN RULED RUSSIA AFTER THE DEATH OF PETER THE GREAT

There were sad sides to Peter's life and character, but one likes to remember how much good he did, how simple were his tastes, and to think of him sitting in an old coat, smoking, with some newly arrived Dutch or English skipper, hearing the latest news in ship-building and trade. This greatly horrified his grand nobles. Peter's reforms were stopped for a time after his death, and there was much misery in the country from factions, palace revolutions, assassinations, and banishments to far-distant Siberia. It has been called the time of the rule of women. Catherine I., Peter's widow, a peasant who could neither read nor write, succeeded him, and in her short reign Behring, a Dane, was sent exploring to Kamchatka. His name was given to the straits, some forty miles wide, that separate Asia from America. When Peter's niece, Anne, came to the throne, another attempt was made to lessen the power of the Crown, and give some measure of self-government to the people, but it failed; and during Anne's reign there was much tyranny by adventurers and others, who succeeded in making her do as they wished.

After her came Elizabeth, the daughter of Peter the Great. In her reign Russia gained the south part of Finland. This country had been converted to Christianity by two Englishmen, St. Henry and St. Thomas, in the twelfth and thirteenth centuries.

THE RETURN OF THE EXILES FROM SIBERIA AFTER THIRTY YEARS

For a long time, Finland was a Swedish province, and sent representatives to the Swedish Diet. Many towns rose up over the picturesque country, and the Finlanders advanced steadily in civilisation, in spite of many attacks. They have enjoyed considerable liberty, and have developed a most sterling and charming national character.

In Elizabeth's time, Russia joined in the European war against Frederick the Great, whose fortunes were at their lowest ebb when the empress died, and her successor, who was an ardent admirer of the Prussian king, and his nephew, made peace with him, and renounced the conquests that had been made. This was Peter III. A strange sight it must have been at his court, when he recalled from Siberia the exiles who had been banished long years before in the various palace quarrels and revolutions of preceding reigns. Some of them had been exiled for thirty years.

Peter was followed by his wife, Catherine II., generally called the Great. Hers was a long and eventful reign, as full of interest as that of Peter the Great. She made many enemies by taking away the lands and peasants belonging to the Church to be the property of the State. The Church had

become enormously rich, and there were great numbers of monasteries and clergy in all parts of the country.

Poland at this time was breaking up, and Russia had a large share of this kingdom. Important as this was, still more advance in the development of the country was made when, at last, after many attempts, Russia reached the Black Sea.

A war with the Turks led to the independence of the Crimea, and Azov was ceded to the Russians. Later, the Crimea was annexed. Catherine made a journey to this new part of her dominions, meeting the Emperor Francis Joseph II. of Germany at Kherson, near the mouth of the Dnieper, and she must have greatly enjoyed its soft beauty and its warm climate, so utterly different from almost all other parts of Russia.

There were not wanting grievous troubles, too, in this reign; among them a terrible plague in Moscow and insurrection among the Don Cossacks. When Catherine died, the long-desired province of Kurland, on the Baltic, had been added, besides the shore on the Black Sea about the Dniester; Odessa, destined, as we shall see, to become a great port for sending away corn, was founded; also the important fort of Sevastopol was built. Among the famous generals of Catherine's day was Suvorov, who distinguished himself in the wars against Frederick the Great of Prussia, against Poland, against the Turks, and, in the reign of her son Paul, in the wars of the French Republic.

Just before Paul's death the ancient kingdom of Georgia, between the Black and Caspian Seas, south of the beautiful Caucasus Mountains, was surrendered to Russia by its last prince. This interesting country had a very ancient Christianity, and long lines of native kings. Its capital was Tiflis. It was open to constant attacks by the Persians and others, and there were many factions within the country itself. In the reign of Paul's son, Alexander I., another great accession to Russian territory was the rest of Finland, surrendered by Sweden.

But Alexander's chief work was the mighty duel with Napoleon. Thousands of Russians had to march hither and thither over the face of Europe, to try to cope with the conqueror. Twenty-one thousand Russians lay dead at Austerlitz. There was none present at Jena; for it was soon after that battle that

When Napoleon and his army caught their first view of Moscow, they were enraptured with the glories of its gilded domes lighted up in the brilliant sun. But their joy was short lived, for the Russians had fired their city in many places, and the ancient capital of the Muscovites was soon a mass of ruins. Here we see Napoleon riding through the burning streets, with an escort, after paying a visit to the palace of Peter the Great.

Napoleon and the Czar of Russia met on a raft in the river Niemen and agreed to divide Europe between them. But Alexander's subjects were ill-satisfied, for a quarrel with England meant much loss of trade. Later, Alexander did not keep to the arrangement he had made with Napoleon, and ventured to neglect his directions against English trade.

How the Russians Burned Their Capital in Its Hour of Doom

This angered Napoleon greatly, and we read elsewhere of the gathering of the Grand Army and its march across Europe to punish Russia. With stubborn courage, the Russians fell back, and yet farther back, till, at last, the French hosts were in sight of Moscow. The Russians determined to sacrifice their splendid and sacred city, and to let the French enter without striking a blow. So the troops and inhabitants retired, removing, in haste, valuables of every kind. When the invading army first saw the brilliant domes of the city, especially of the Kremlin quarter, where fortresses, palaces, and cathedral form a grand sight, loud shouts of triumph, "Moscow! Moscow!" burst from them. They were astonished to find it empty; and no sooner were they settled in the city than fires burst out. In six days, nine-tenths of it were destroyed. Napoleon waited five weeks in the smoking ruins, hoping that Alexander would treat for peace; but he made no sign, and the French had to retire, beaten by the terrible foes of cold and starvation.

In the reign of Nicholas, renewed efforts to obtain a constitution were made, and, in a war with Persia, two provinces were gained that became steps on the way to Central Asia.

Later in the century, the Russian boundary was extended to within a few hundred miles of the frontier of India, and, by a treaty with China, the Russians gained the left bank of the Amur river, and founded Vladivostock, the "Lord of the East," on the Sea of Japan.

How Poland Fought for Freedom and Lost Its National Life

As we read in the story of the Balkan Peninsula, told on another page, all through the nineteenth century struggles for freedom from Mohammedan masters have often involved interference by Russia, as head of the Greek Church, to which most of the oppressed states belong. This interference caused many wars. The Poles made brave efforts for freedom, that finally resulted in the loss of the constitution which had been granted; many other rights were taken away, and Poland was declared a Russian province in 1864.

France and England declared war against Russia in 1854, because they were afraid, if the Turks were driven out of Europe, Russia would seize Constantinople, and become too powerful. So the Allies invaded the Crimea, bombarded Odessa, and also sent a fleet to the Baltic. There are many who still remember the excitement, as news of the war reached England. The passage of the Alma, the siege of Sevastopol, the battle of Inkerman, followed in succession. The brilliant charge of the Light Cavalry at Balaclava is described in Tennyson's poem on page 1782.

"It is magnificent," said a French onlooker, "but it is not war!"

The Setting Free of the Serfs and the Killing of Their Liberator

Many still remember, too, the indignation felt at the mismanagement of the war, and the needless sufferings of our soldiers for want of proper clothing and food, and the delirious joy of the country at the proclamation of peace. Miss Florence Nightingale's hospital for the sick soldiers was at Scutari, opposite Constantinople, and the remains of many British soldiers rest there, under the dark cypress-trees.

In the reign of Alexander II., the serfs, whose condition had been slowly improving, were set free in 1861. Many other reforms were set in hand: railways were begun, trade and industries were encouraged. But for years Russia has been struggling for a constitution, which is still delayed; and the reforms of other kinds, which are slowly making their way in the vast empire, move too slowly for many ardent patriots, who often get into sore trouble for speaking, or writing, or plotting against the authorities.

Alexander, the liberator of the serfs, was killed by a bomb, after many repeated attacks on his life. His son, Alexander III., married a sister of Queen Alexandra, of England. Their son, Nicholas II., is now czar, with a score of titles besides, for his dominions take in half Europe and a third of Asia.

THE NEXT STORY OF COUNTRIES WILL BE ON PAGE 3745

WORDSWORTH'S GREATEST POEM

WE have read many of Wordsworth's poems in this book, and we are now to read the greatest of all the many poems he wrote, though by no means the longest. Many people may think that it is too difficult for children to understand; but children can understand far more than is often supposed, and there is no real reason why they should not read this famous ode, with some explanations. Its full title is "Intimations of Immortality from Recollections of Childhood." That is to say, the poet in manhood seeks to base his belief in the future life on recollections of the thoughts that came to him as a boy. Surely that fact alone makes his great poem a suitable one for printing in this book.

ODE ON IMMORTALITY

A POET'S MEMORIES OF HIS CHILDHOOD

CONTINUED FROM 3560

The poet begins by stating that the dreams and visions of his youth had made the earth, and all his eyes had looked upon in early years, so beautiful to him, that in later life, when the commoner sights had become so familiar to him, they seemed to have lost some of the qualities they once possessed.

THERE was a time when meadow, grove, and stream,
The earth, and every common sight,
To me did seem
Apparelled in celestial light,
The glory and the freshness of a dream.
It is not now as it hath been of yore:
Turn wheresoe'er I may,
By night and day,
The things which I have seen I now can see no more.

II.

His knowledge tells him that earth and all its wonders are not less fair than when he was young; but they have lost the "glory" which they had when his young eyes and opening mind first beheld them. As we grow older, we all experience this same change, just as "familiarity breeds contempt."

The Rainbow comes and goes,
And lovely is the Rose;
The Moon doth with delight
Look round her when the heavens are bare;
Waters on a starry night
Are beautiful and fair;
The sunshine is a glorious birth;
But yet I know, where'er I go,
That there hath past away a glory from the earth.

III.

But there are times in our later years when the singing of the birds and the frisking of the lambs suddenly bring up, as in a flash, our childhood's happy visions, and though we may be old in years we are as children again in memory.

Now, while the Birds thus sing a joyous song,
And while the young Lambs bound
As to the tabor's sound,
To me alone there came a thought of grief:
A timely utterance gave that thought relief,
And I again am strong:
The Cataracts blow their trumpets from the steep;
No more shall grief of mine the season wrong;
I hear the echoes through the mountains throng,
The Winds come to me from the fields of sleep,
And all the earth is gay;
Land and sea
Give themselves up to jollity
And with the heart of May
Doth every beast keep holiday;—
Thou child of joy,
Shout round me, let me hear thy shouts, thou happy Shepherd-boy!

IV.

Yet, in the midst of his delight in thus living over again his childhood's joys, the poet finds himself making note of some things—a tree and a field—that seem to be different now as compared with his early visions of them; thus the spell is broken, he is a man again, and trained thought takes the place of simple natural feeling and delight.

Ye blessed creatures, I have heard the call
Ye to each other make; I see
The heavens laugh with you in your jubilee;
My heart is at your festival,
My head hath its coronal,
The fulness of your bliss, I feel—I feel it all.
O evil day! if I were sullen
While the earth herself is adorning
This sweet May-morning,
And the children are pulling
On every side,
In a thousand valleys far and wide,
Fresh flowers; while the sun shines warm,
And the babe leaps up on his mother's arm:—
I hear, I hear, with joy I hear!
—But there's a tree, of many one,
A single field which I have looked upon,
Both of them speak of something that is gone;
The Pansy at my feet
Doth the same tale repeat:
Whither is fled the visionary gleam?
Where is it now, the glory and the dream?

V.

Then he begins to think what these remembered visions of his vanished childhood may mean. In this great stanza he sets forth his thoughts. We may have lived before, and, as in manhood we catch fleeting visions of our childhood, so may we have faint visions of a previous existence.

Our birth is but a sleep and a forgetting:
The Soul that rises with us, our Life's Star,
Hath had elsewhere its setting,
And cometh from afar:
Not in entire forgetfulness,
And not in utter nakedness,
But trailing clouds of glory do we come
From God, who is our home:
Heaven lies about us in our infancy!
Shades of the prison-house begin to close
Upon the growing Boy,
But He beholds the light, and whence it flows
He sees it in his joy;

The Youth, who daily farther from the East
Must travel, still is Nature's Priest,
And by the vision splendid
Is on his way attended ;
At length the man perceives it die away,
And fade into the light of common day.

VI.

It may be, the poet suggests, that our present existence here on earth, with all its distractions and pleasures, has dulled in us the memory of the "imperial palace," or heaven, whence our souls have come, just as the experiences of manhood and age certainly dull in us the memories of our childhood.

Earth fills her lap with pleasures of her own ;
Yearnings she hath in her own natural kind,
And even with something of a mother's mind,
And no unworthy aim,
The homely Nurse doth all she can,
To make her foster-child, her inmate Man,
Forget the glories he hath known,
And that imperial palace whence he came.

VII.

The thought expressed in the previous stanza is followed further in the next. But we are to remember that the poet never asserts as a fact that he believes in a past existence. The idea is a very old one and is a feature of some religions, such as Buddhism, and the poet suggests it for a poetic purpose which will presently appear.

Behold the Child among his new-born blisses,
A six years' darling of a pigmy size !
See, where 'mid work of his own hand he lies,
Fretted by sallies of his Mother's kisses,
With light upon him from his Father's eyes !
See, at his feet, some little plan or chart,
Some fragment from his dream of human life,
Shaped by himself with newly-learned art ;
A wedding or a festival,
A mourning or a funeral,
And this hath now his heart,
And unto this he frames his song :
Then he will fit his tongue
To dialogues of business, love or strife ;
But it will not be long
Ere this be thrown aside,
And with new joy and pride
The little Actor cons another part ;
Filling from time to time his "humorous stage"
With all the persons, down to palsied age,
That Life brings with her in her equipage ;
As if his whole vocation
Were endless imitation.

VIII.

The poet now addresses the child. The little boy, the little girl, is the greatest wonder of the world ! For in his little body is the seed of everlasting life ; he is "glorious in the sight of heaven-born freedom ;" but, as the years grow upon him and make the wonders of the world commonplaces to him, he will become less and less conscious of the wonders he moves among ; "custom" will "lie upon" him ; he will do his daily work with far too little thought of his immortal powers.

Thou, whose exterior semblance doth belie
Thy soul's immensity ;
Thou best Philosopher, who yet dost keep
Thy heritage ; thou Eye among the blind,
That, deaf and silent, read'st the eternal deep,
Haunted for ever by the eternal mind,—
Mighty Prophet ! Seer blest !
On whom those truths do rest,
Which we are toiling all our lives to find,
In darkness lost, the darkness of the grave ;
Thou, over whom thy immortality
Broods like the day, a master o'er a slave,
A presence which is not to be put by ;
Thou little Child, yet glorious in the might
Of heaven-born freedom on thy being's height,
Why with such earnest pains dost thou provoke
The years to bring the inevitable yoke,
Thus blindly with thy blessedness at strife ?
Full soon thy soul shall have her earthly freight,
And custom lie upon thee with a weight,
Heavy as frost, and deep almost as life !

IX.

Yet, just as at times these visions of our childhood rise again in our mind, so must we in our later years, when our knowledge is ripened, realise that these visions have a mighty power in opening for us the very gateways of immortality. They are not so much to be regarded as glimpses of a life that is past, as of an immortal life of the soul which endures for ever. The very fact that such thoughts ever arise in us is a proof that there exists for us some other life beyond the life we are living in this world to-day. They are like the echoes, far away and faint, of a great sea ; that sea is the immortal life of the soul, and death is but the beginning of our heavenly voyage, our launching on the immortal sea.

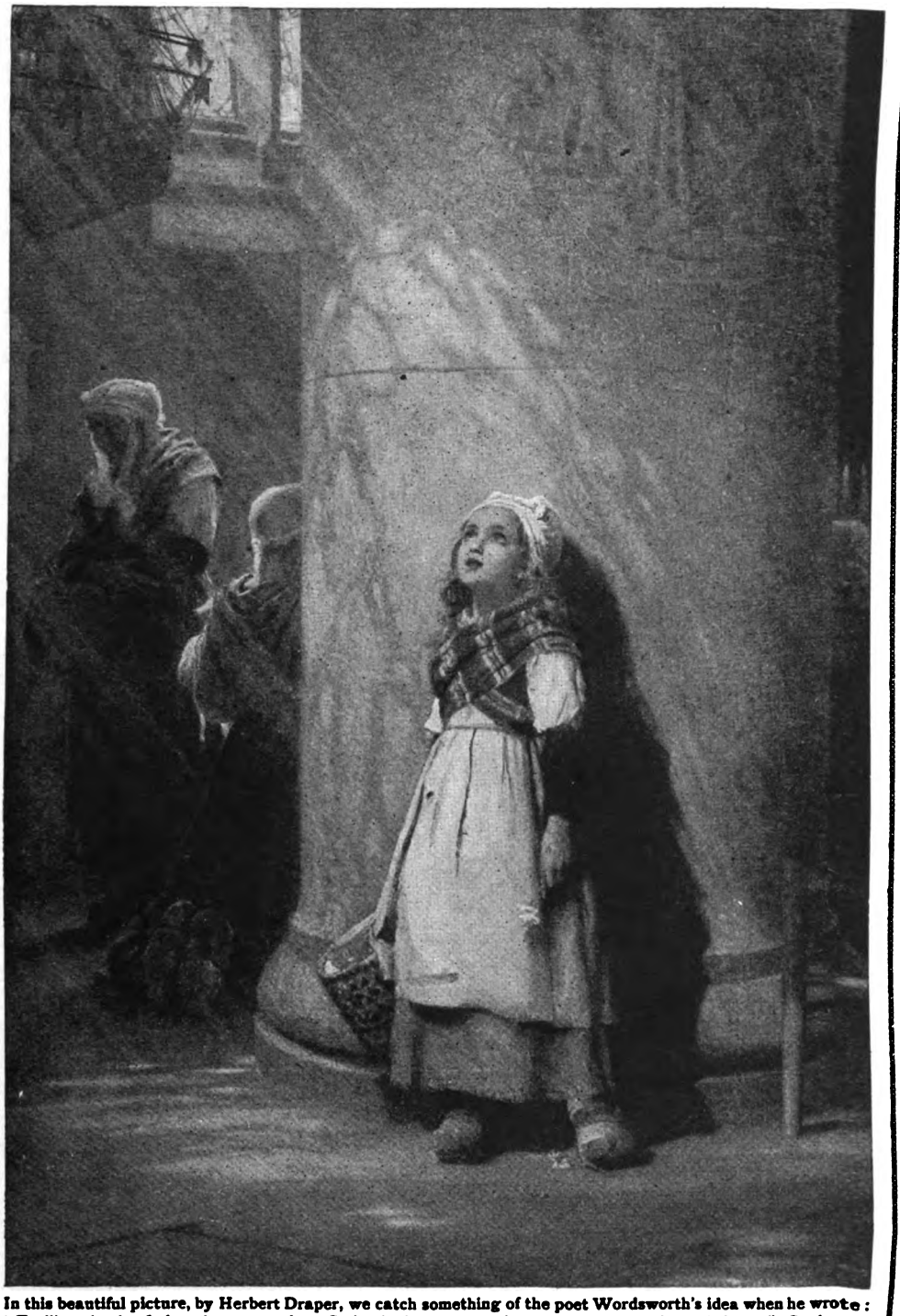
O joy ! that in our embers
Is something that doth live,
That nature yet remembers
What was so fugitive !
The thought of our past years in me doth breed
Perpetual benediction : not indeed
For that which is most worthy to be blest ;
Delight and liberty, the simple creed
Of childhood, whether busy or at rest,
With new-fledged hope still fluttering in his breast :—
Not for these I raise
The song of thanks and praise ;
But those obstinate questionings
Of sense and outward things,
Fallings from us, vanishings ;
Blank misgivings of a Creature
Moving about in worlds not realised,
High instincts before which our mortal Nature
Did tremble like a guilty thing surprised :
But for those first affections,
Those shadowy recollections,
Which, be they what they may,
Are yet the fountain light of all our day,
Are yet a master light of all our seeing ;
Uphold us, cherish, and have power to make
Our noisy years seem moments in the being
Of the eternal Silence : truths that wake,
To perish never ;
Which neither listlessness, nor mad endeavour,
Nor Man nor Boy,
Nor all that is at enmity with joy,
Can utterly abolish or destroy !
Hence, in a season of calm weather,
Though inland far we be,
Our souls have sight of that immortal sea
Which brought us hither,
Can in a moment travel thither,
And see the children sport upon the shore,
And hear the mighty waters rolling evermore.

X.

Thus, at last in our old age, even when worldly knowledge may have dulled our childhood's memories, the joyous feelings of our early years may yet awaken within us, and our ripened senses should tell us that these feelings are the very truth of God speaking to us, not in words, but in a way no words can speak, of the immortal life to which we are born, if we only have "the faith that looks through death."

Then sing, ye Birds, sing, sing a joyous song !
And let the young Lambs bound
As to the tabor's sound !
We in thought will join your throng,
Ye that pipe and ye that play,
Ye that through your hearts to-day
Feel the gladness of the May !

THE HEAVEN THAT LIES ABOUT A CHILD



In this beautiful picture, by Herbert Draper, we catch something of the poet Wordsworth's idea when he wrote: "Trailing clouds of glory do we come from God, who is our home; heaven lies about us in our infancy." Gazing at the sunlight as it pours through the stained-glass windows of the church, the child seems to see visions of paradise.

What though the radiance which was once
so bright
Be now for ever taken from my sight,
Though nothing can bring back the hour
Of splendour in the grass, of glory in the
flower;
We will grieve not, rather find
Strength in what remains behind:
In the primal sympathy
Which having been must ever be;
In the soothing thoughts, that spring
Out of human suffering,
In the faith that looks through death,
In years that bring the philosophic mind.

XI.

So that, in the end, when we are old, if we have preserved our faith, though we may have lost the keen sense of wonder and delight we enjoyed in childhood, we shall still, in a different way, rejoice in all God's beautiful creation. The glory of the setting sun is the glory of our lives if we have lived righteously in the eye of God. When the sun of our life sets, it will rise again in the other world that endures for ever and is known to us as heaven. Thus do we see how, from the recollections of his own childhood, the poet is led to believe in the undying life of the soul.

And O, ye Fountains, Meadows, Hills, and
Groves,
Think not of any severing of our loves!
Yet in my heart of hearts I feel your might;
I only have relinquished one delight
To live beneath your more habitual sway.
I love the Brooks which down their channels
fret,
Even more than when I tripped lightly as they;
The innocent brightness of a new-born Day
Is lovely yet;
The Clouds that gather round the setting sun
Do take a sober colouring from an eye
That hath kept watch o'er man's mortality;
Another race hath been, and other palms are
won.
Thanks to the human heart by which we live,
Thanks to its tenderness, its joys, and fears,
To me the meanest flower that blows can give
Thoughts that do often lie too deep for tears.

THE DESERTED HOUSE

Tennyson here reads us a little lesson in life and immortality. The deserted house may be likened to the earthly body of man when death has taken possession of it and the soul has gone away to live "in a mansion incorruptible."

Life and Thought have gone away
Side by side,
Leaving door and windows wide—
Careless tenants they!

All within is dark as night;
In the windows is no light;
And no murmur at the door,
So frequent on its hinge before.

Close the door, the shutters close,
Or thro' the windows we shall see
The nakedness and vacancy
Of the dark, deserted house.

Come away. No more of mirth
Is here, or merry-making sound.
The house was builded of the earth,
And shall fall again to ground.

Come away—for Life and Thought
Here no longer dwell;
But in a city glorious—
A great and distant city—have bought
A mansion incorruptible.
Would they could have staid with us!

MY COUNTRY, 'TIS OF THEE

This song, written in 1832 by an American Baptist clergyman named Samuel Francis Smith, has long been regarded as the national hymn of our American people, breathing, as it does, the spirit of liberty which the government of our country offers to its citizens.

My country, 'tis of thee,
Sweet land of liberty,
Of thee I sing;
Land where my fathers died,
Land of the pilgrim's pride,
From every mountain side
Let freedom ring.

My native country, thee—
Land of the noble free—
Thy name—I love;
I love thy rocks and rills,
Thy woods and templed hills;
My heart with rapture thrills
Like that above.

Let music swell the breeze,
And ring from all the trees
Sweet freedom's song:
Let mortal tongues awake;
Let all that breathe partake;
Let rocks their silence break—
The sound prolong.

Our father's God, to Thee,
Author of liberty,
To Thee we sing:
Long may our land be bright
With freedom's holy light,
Protect us by Thy might,
Great God, our King.

AT LAST

John Greenleaf Whittier, the Quaker writer, lived to 85, and towards the end of his life could sing with undimmed faith of his simple all-sufficing trust in God, as in this poem.

When on my day of life the night is falling,
And in the winds from unsunned spaces
blown,
I hear far voices out of darkness calling
My feet to paths unknown.

Thou who hast made my home of life so
pleasant,
Leave not its tenant when its walls decay;
O, Love divine, O, Helper ever present,
Be Thou my strength and stay!

Be near me when all else is from me drifting:
Earth, sky, home's pictures, days of shade
and shine.
And kindly faces to my own uplifting
The love which answers mine.

I have but Thee, O Father! Let Thy Spirit
Be with me then to comfort and uphold;
No gate of pearl, no branch of palm I merit,
Nor street of shining gold.

Suffice it if—my good and ill unreckoned,
And both forgiven through Thy abounding
grace—
I find myself by hands familiar beckoned
Unto my fitting place.

Some humble door among Thy many mansions
Some sheltering shade where sin and
striving cease,
And flows for ever through heaven's green
expansions
The river of Thy peace.

There, from the music round about me stealing,
I fain would learn the new and holy song,
And find, at last, beneath Thy trees of healing,
The life for which I long.

TO THE RIVER CHARLES

Longfellow, our American poet, as has often been pointed out, loves to celebrate in verse scenes of natural beauty, and if we go through his poems we shall find that almost everywhere he travelled or lived during his life he found some subject to write about in the rivers, mountains, towns, or castles. The River Charles, of which he sings in this poem, is a stream that flows into the sea at Boston Harbour.

RIVER that in silence windest
Through the meadows, bright and free,
Till at length thy rest thou findest
In the bosom of the sea.

Four long years of mingled feeling,
Half in rest, and half in strife,
I have seen thy waters stealing
Onward, like the stream of life.

Thou hast taught me, silent river,
Many a lesson deep and long;
Thou has been a generous giver,
I can give thee but a song.

Oft in sadness, and in illness,
I have watched thy current glide
Till the beauty of its stillness
Overflowed me, like a tide.

And in better hours and brighter,
When I saw thy waters gleam,
I have felt my heart beat lighter,
And leap onward with thy stream.

Not for this alone I love thee,
Nor because thy waves of blue
From celestial seas above thee
Take their own celestial hue.

Where yon shadowy woodlands hide thee,
And thy waters disappear,
Friends I love have dwelt beside thee,
And have made thy margin dear.

THE BUTTERFLY AND THE SNAIL

Elsewhere one of the fables in verse by John Gay is printed. Another poem of the same kind by that author is here given. In this class of poetry there is very little scope for originality, either of thought or form. Fables in verse are very much alike, but, if they are as well written as those of Gay, they never tire the reader, and, even when the "moral" is an old one, it has the enduring value of a good sermon, which, as we know, can be preached more than once.

AS in the sunshine of the morn
A butterfly (but newly born)
Sat proudly perking on a rose,
With pert conceit his bosom glows;
His wings (all glorious to behold)
Bedropt with azure, jet, and gold,
Wide he displays; the spangled dew
Reflects his eyes and various hue.
His now forgotten friend, a snail,
Beneath his house, with slimy trail,
Crawls o'er the grass, whom when he spies,
In wrath he to the gardener cries:
"What means yon peasant's daily toil,
From choking weeds to rid the soil?
Why wake you to the morning's care?
Why with new arts correct the year?
Why grows the peach's crimson hue?
And why the plum's inviting blue?
Were they to feast his taste design'd,
That vermin of voracious kind?
Crush then the slow, the pilfering race,
So purge thy garden from disgrace."
"What arrogance!" the snail replied;
"How insolent is upstart pride!
Hadst thou not thus, with insult vain
Provok'd my patience to complain,
I had conceal'd thy meaner birth,
Nor trac'd thee to the scum of earth;
For scarce nine suns have wak'd the hours,
To swell the fruit, and paint the flowers,
Since I thy humbler life survey'd,
In base, in sordid guise array'd.
I own my humble life, good friend;
Snail was I born and snail shall end.
And what's a butterfly? At best
He's but a caterpillar drest;
And all thy race (a numerous seed)
Shall prove of caterpillar breed."

BIG AND LITTLE THINGS

Mr. Alfred H. Miles, who has compiled an important work entitled "The Poets and Poetry of the Nineteenth Century," is himself a poet, and has written much both for grown-ups and children. We have chosen here one of his pieces for young people, which conveys a useful lesson in clear and familiar language.

I CANNOT do the big things
That I should like to do,
To make the earth for ever fair,
The sky for ever blue.

But I can do the small things
That help to make it sweet;
Tho' clouds arise and fill the skies,
And tempests beat.

I cannot stay the raindrops
That tumble from the skies;
But I can wipe the tears away
From baby's pretty eyes.

I cannot make the sun shine,
Or warm the winter bleak;
But I can make the summer come
On sister's rosy cheek.

I cannot stay the storm clouds,
Or drive them from their place;
But I can clear the clouds away
From brother's troubled face.

I cannot make the corn grow,
Or work upon the land;
But I can put new strength and will
In father's busy hand.

I cannot stay the east wind,
Or thaw its icy smart;
But I can keep a corner warm
In mother's loving heart.

I cannot do the big things
That I should like to do,
To make the earth for ever fair,
The sky for ever blue.

But I can do the small things
That help to make it sweet;
Tho' clouds arise and fill the skies
And tempests beat.

LITTLE VERSES FOR VERY LITTLE PEOPLE

THE man in the wilderness asked me,
How many strawberries grew in the sea ?
I answered him, as I thought good,
As many as red herrings grew in the wood.

PEG, Peg, with a wooden leg,
Her father was a miller;
He tossed the dumpling at her head,
And said he could not kill her.

I HAD a little moppet,
I put it in my pocket,
And fed it with corn and hay,
There came a proud beggar
And swore he would have her,
And stole my little moppet away.

SIMON BRODIE had a cow;
He lost his cow and could not find her;
When he had done what man could do,
The cow came home and her tail behind her.

THE King of Clubs, he often drubs
His loving Queen and wife.
The Queen of Clubs returns his snubs,
And all is noise and strife.
The Knave of Clubs gives winks and rubs,
And swears he'll take her part !
For when our kings will do such things,
They should be made to smart.

The Diamond King I fain would sing,
And likewise his fair Queen,
But that the Knave, a haughty slave,
Must needs step in between.
"Good Diamond King, with hempen string
This haughty Knave destroy !
Then may your Queen, with mind serene,
Your royal love enjoy."

The King of Spades he kissed the maids,
Which grieved the Queen full sore;
The Queen of Spades, she beat those maids
And turned them out of door.
The Knave of Spades grieved for those jades,
And did for them implore;
The Queen so gent, she did relent,
And vowed she'd strike no more.

MARY had a pretty bird,
Feathers bright and yellow;
Slender legs—upon my word,
He was a pretty fellow.
The sweetest note he always sung,
Which much delighted Mary;
She often, where the cage was hung,
Sat hearing her canary.

THE Robin and the Wren
Fought about the porridge-pan;
And ere the Robin got a spoon,
The Wren had ate the porridge down.

ON Saturday night
Shall be all my care
To powder my locks
And curl my hair.

On Sunday morning
My love will come in,
When he will marry me
With a gold ring.

Two little dogs sat by the fire,
Over a fender of coal-dust;
When one said to the other dog,
"If Pompey won't talk, why, I must."

As little Jenny Wren
Was sitting by the shed,
She waggled with her tail,
And nodded with her head.

She waggled with her tail,
And nodded with her head,
As little Jenny Wren
Was sitting by the shed.

HUSH, baby, my dolly, I pray you don't cry,
And I'll give you some bread and some milk by and by;
Or perhaps you like custard, or may be a tart,
Then to either you're welcome, with all my heart.

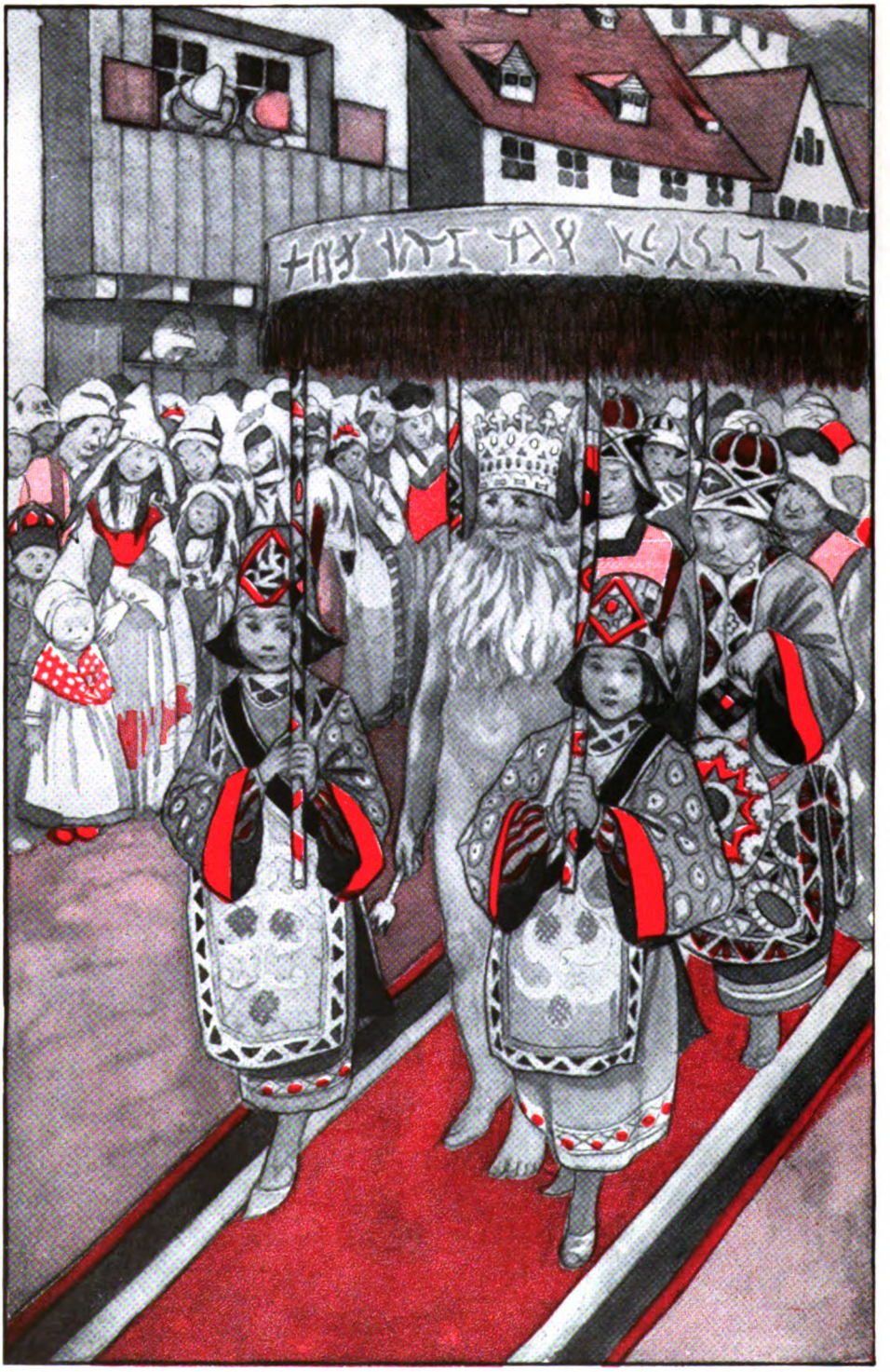
GREAT A, little a, bouncing B,
The cat's in the cupboard and she can't see.

HEY diddle, dinkety, poppety, pet,
The merchants of London they wear scarlet;
Silk in the collar, and gold in the hem,
So merrily march the merchantmen.

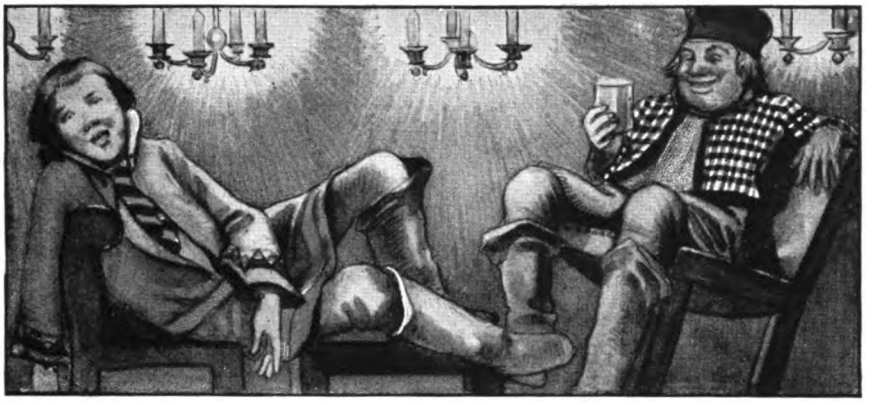
TRIP UPON TRENDIES

Trip upon trendies, and dance upon dishes,
My mother sent me for some barm, some barm;
She bid me tread lightly, and come again quickly,
For fear the young men should do me some harm.
Yet didn't you see, yet didn't you see,
What naughty tricks they put upon me?
They broke my pitcher, and knocked me down,
And huffed my mother, and tore my gown,
And kissed my sister instead of me!

THE EMPEROR WALKED IN THE PROCESSION



The emperor walked under his high canopy in the midst of the procession, and all the people cried out: "Oh, how beautiful are our emperor's new clothes!" "But the emperor has nothing on!" said a little child.



THE EMPEROR'S NEW CLOTHES

CONTINUED FROM 3582

MANY years ago, there was an emperor who was so fond of new clothes that he spent all his money in dress. He did not trouble in the least about his soldiers; nor did he care to go either to the theatre or the chase, except that they gave him opportunities for displaying his new clothes. He had a different suit for each hour of the day; and instead of saying of him: "He is sitting in council," people always said: "The emperor is sitting in his wardrobe."

Time passed away merrily in the large town which was his capital; strangers arrived every day at the court. One day, two rogues, calling themselves weavers, made their appearance. They gave out that they knew how to weave stuffs of the most beautiful colours and elaborate patterns, the clothes manufactured from which should have the wonderful power of remaining invisible to everyone who was unfit for the office he held, or who was extraordinarily simple in character.

"These must indeed be splendid clothes!" thought the emperor. "Had I such a suit, I might at once find out what men in my realm are unfit for their office, and also be able to distinguish the wise from the foolish. This stuff must be woven for me immediately." And he caused large sums of money to be given to both the weavers, in order that they might begin their work directly. So the two pretended weavers set up two looms, and affected to work very busily, though in reality they did nothing at all. They asked for the most delicate silk and the purest gold thread, put both into their own knapsacks, and then continued their pretended work at the empty looms until late at night.

"I should like to know how the weavers are getting on with my cloth," said the emperor to himself, after some little time had elapsed He was, however, rather embarrassed, when he remembered that a simpleton, or one unfit for his office, would be unable to see the manufacture. "To be sure," he thought, "I have nothing to risk in my own person; but yet I would prefer sending somebody else to bring me intelligence about the weavers and their work, before I trouble myself in the affair."

All the people throughout the city had heard of the wonderful power the cloth was to possess; and all were anxious to learn how wise, or how ignorant, their neighbours might prove to be.

"I will send my faithful old minister to the weavers," said the emperor at last; "he will be best able to see how the cloth looks; for he is a very sensible man, and no one can be more suitable for his office than he is."

So the faithful old minister went into the hall, where the knaves were apparently working with all their might at their empty looms.

"What can be the meaning of this?" thought the old man, opening his eyes very wide. "I cannot discover the least bit of thread on the looms!"

However, he did not express his thoughts aloud.

The impostors requested him to be so good as to come nearer their looms, and then asked him whether the design pleased him, and whether the colours were not very beautiful, at the same time pointing to the empty frames. The poor old minister looked and looked, but he could not discover anything on the looms, for a very good reason—there was nothing there.

"What!" thought he again, "is it possible that I am a simpleton? I have never thought so myself; and, at any rate, if I am so, no one must know it. Can it be that I am unfit for my office? No, that must not be said either. I will never confess that I could not see the stuff."

"Well, sir minister," said one of the knaves, still pretending to work, "you do not say whether the stuff pleases you."

"Oh, it is admirable!" replied the old minister, looking at the loom through his spectacles. "This pattern, and the colours—I will tell the emperor how very beautiful I think them."

"We shall be much obliged to you," said the impostors; and then they named the different colours and described the patterns of the pretended stuff. And then the knaves asked for more silk and gold, saying that it was necessary to complete what they had begun. However, they put all that was given them into their knapsacks, and continued to work with as much apparent diligence as before at their empty looms.

The emperor now sent another officer of his court to see how the men were getting on, and to find out whether the cloth would soon be ready. It was just the same with this gentleman as with the minister; he surveyed the looms on all sides, but could see nothing at all but the empty frames.

"Does not the stuff appear as beautiful to you as it did to my lord the minister?" asked the impostors of the emperor's second ambassador.

"I certainly am not stupid!" thought the messenger. "It must be that I am not fit for my good, profitable office! That is very odd; however, no one shall know anything about it." And accordingly he praised the stuff he could not see, and declared that he was delighted with both colours and patterns. "Indeed, please your Imperial Majesty," said he to his sovereign, when he returned, "the cloth which the weavers are preparing is extraordinarily magnificent."

And now the emperor himself wished to see the costly manufacture, while it was still on the loom. Accompanied by a select number of officers of the court, among whom were the two honest men who had already admired the cloth, he went to the crafty impostors, who, as soon as they were aware of the emperor's approach, went on working more diligently than ever, although they still did not pass a single thread through the looms.

"Is not the work absolutely magnificent?" said the two officers of the crown already mentioned. "If your Majesty will only be pleased to look at it! What a splendid design! What glorious colours!" And at the same time they pointed to the empty frames, for they imagined that everyone but themselves could see this exquisite piece of workmanship.

"How is this?" said the emperor to himself. "I can see nothing. This is indeed a terrible affair! Am I a simpleton, or am I unfit to be an emperor? That would be the worst thing that could happen. . . . Oh, the cloth is charming!" said he aloud. And he smiled most graciously, and looked closely at the empty looms, for on no account would he say that he could not see what two of the officers of his court had praised so much. All his retinue now strained their eyes, hoping to discover something on the looms, but they could see no more than the others. Nevertheless, they all exclaimed: "Oh, how beautiful!" and advised his Majesty to have some new clothes made from this splendid material for the procession that was going to take place very soon. The two rogues sat up the whole of the night before the day on which the

procession was to take place, and had sixteen lights burning, so that everyone might see how anxious they were to finish the emperor's new suit. When the day arrived, they came to the palace with huge boxes.

"If your Imperial Majesty will be graciously pleased to have your clothes taken off, we will fit on the new suit in front of the looking-glass," they said.

The emperor was accordingly undressed, and the rogues pretended to array him in his new suit, the emperor turning round, from side to side, before the looking-glass.

"How splendid his Majesty looks in his new clothes, and how well they fit!" everyone cried out. "What a design! These are indeed royal robes!"

"The canopy which is to be borne over your Majesty in the pageant is waiting," said the master of ceremonies.

"I am quite ready," answered the emperor. "Do my new clothes fit well?" asked he, turning himself round again before the looking-glass, in order that he might appear to be examining his handsome suit.

The lords of the bed-chamber, who were to carry his Majesty's train, felt about on the ground as if they were lifting up the ends of the mantle, and pretended to be carrying something, for they would by no means betray anything that looked like simplicity, or unfitness for their office.

So now the emperor walked under his high canopy, in the midst of the procession, through the streets of his capital; and all the people standing by, and those at the windows, cried out: "Oh, how beautiful are our emperor's new clothes! What a magnificent train there is to the mantle; and how gracefully the scarf hangs!" In short, no one would allow that he was unable to see these much-admired clothes.

WHEN THE DAY ARRIVED THE ROGUES CAME TO THE PALACE WITH HUGE BOXES

"But the emperor has nothing on!" said a little child. "Listen to the voice of innocence!" exclaimed his father. And what the child had said was whispered from one to another.

"But he has nothing on!" at last cried out all the people. The emperor was vexed, for he knew that the people were right. And at last, believing that he was really unfitted for his throne, he resolved to give up trivial things and rule his kingdom well. The weavers, fearing to be punished, fled and were forgotten, and the emperor and his people lived in happiness for many, many years.

SCRAMBLEPIPE TRIES TO UNDERSTAND

The Gnomes who Set Out for Christmas and Found that the World is Round

It was the twenty-fourth of June. The twenty-fourth of June is Midsummer Day. Screwworm said to Scramblepipe: "Christmas is coming."

Every gnome had a vast respect for Screwworm. When Screwworm spoke, everybody listened. When Screwworm asked a question, everybody thought, reflected, took a turn round the garden, or sat with their heads in cold water, before making an answer. Screwworm, in short, was immensely wise.

Now, the only gnome who was not in his heart convinced of Screwworm's wisdom was Burrowjack. Burrowjack was a light fellow. Once a week he had a punning day. It was the same day as Mrs. Burrowjack's washing-day. She filled the house with steam; he filled the air with puns.

When Screwworm said to Scramble pipe on Midsummer Day: "Christmas is coming," Scramblepipe immediately leant his brow upon his hand and plunged into profoundest thought. He knew that there was something deep in the idea. Screwworm had uttered it.

Burrowjack, who was sitting on a toadstool outside the cave, blowing bubbles with soap-water from his wife's wash-tub, pricked up his ears and listened.

"I can't get it," said Scramblepipe, after a long meditation. "I'm sorry, Screwworm; it's stupid of me, but I can't get it. *Christmas is coming.* No; I don't follow you. Perhaps if I went out, took a Turkish bath, and lay down for an hour or two, it might come to me and I might understand."

"*There isn't time,*" said Screwworm. "Scramblepipe, make yourself easy. This is not a usual thought. It surprises *me.* It's TREMENDOUS!"

"Then I give it up," said Scramblepipe, with a grateful sigh.

"It is, if I may say so," said Screwworm, "one of those ideas which come to the brain of only the wisest, and that only once in a million years. Be quite easy, Scramblepipe, but reverent; I will explain. Christmas is coming *because summer is going.* If summer is going, Christmas must be coming. Now, in a certain sense, it may be argued that, while summer is here, Christmas cannot be here, too. But that is not my point. Summer undoubtedly is here, as much here as any one thing can ever be said to be here at all. But, what is Here? Have you ever seen Here? Have you ever taken it in your hands, examined it, punched its head, heard it squeak, or counted its waistcoat buttons? *Has it got waistcoat buttons?* We are in profound ignorance. Scramblepipe, I will let you into a secret. I don't believe there is any such thing as Here."

"It's coming to me," said Scramblepipe thoughtfully.

"Now, if Christmas is coming," continued Screwworm, "it is something that is alive and real. Far from going, it is coming. The two movements are as different as life and death. If summer is going, it is something mortal; if Christmas is coming, it is something immortal. If we stay here waiting, while something is going, we shall be left."

"Oh, I feel as if I am being tickled all over!" exclaimed Scramblepipe, interrupting. "I've nearly got it, nearly, almost, practically got it; but not quite. It eludes me, just as I think I'm certain of it."

"A thing that is going is ceasing to be; a thing that is coming must exist, to be coming," said Screwworm.

Scramblepipe leaped to his feet.

"Got it! Got it!" he cried excitedly. He began to dance—singing, grinning, laughing, cackling, and whistling. Suddenly, he stopped dead, his face livid. "Screwworm," he said, "it has gone!"

"My point," said old Screwworm, "is this: a thing that is coming must have a place from which to come. If, instead of waiting for that thing to come, we go to the place from which it is coming, shall we not be in the possession of something that is never going at all? In other words, if——"

Scramblepipe buried his head in his hands.

"Come with me," said Screwworm kindly; "I will show you what I mean." They rose up and went out together.

"Can you tell me," said Burrowjack, "who bade the field farewell? I am speaking of the bird. Say it over slowly to yourselves, thus: Who—bade—the field—fare—well."

"His mother," said Screwworm, "for no one else would take the trouble to do so."

For many days and nights these intrepid explorers journeyed across the earth to find Christmas. Weeks and months passed. Their clothes were in rags, their shoes were worn to shreds, their legs were so stiff that they could scarcely lift their feet. But still they journeyed on.

BURROWJACK WAS SITTING ON A TOADSTOOL OUTSIDE THE CAVE BLOWING BUBBLES

"No," replied Burrowjack. "Beautifully no. The answer is Adieu drop."

"Burrowjack," said Screwworm, "leave this sorry jesting, and hear my words. We go to discover Christmas."

"Courage!" said Screwworm, "courage! All we need is courage."

"It's certainly a splendid idea of yours," said Scramblepipe. "It takes time to come to it; but it's a magnificent idea!"

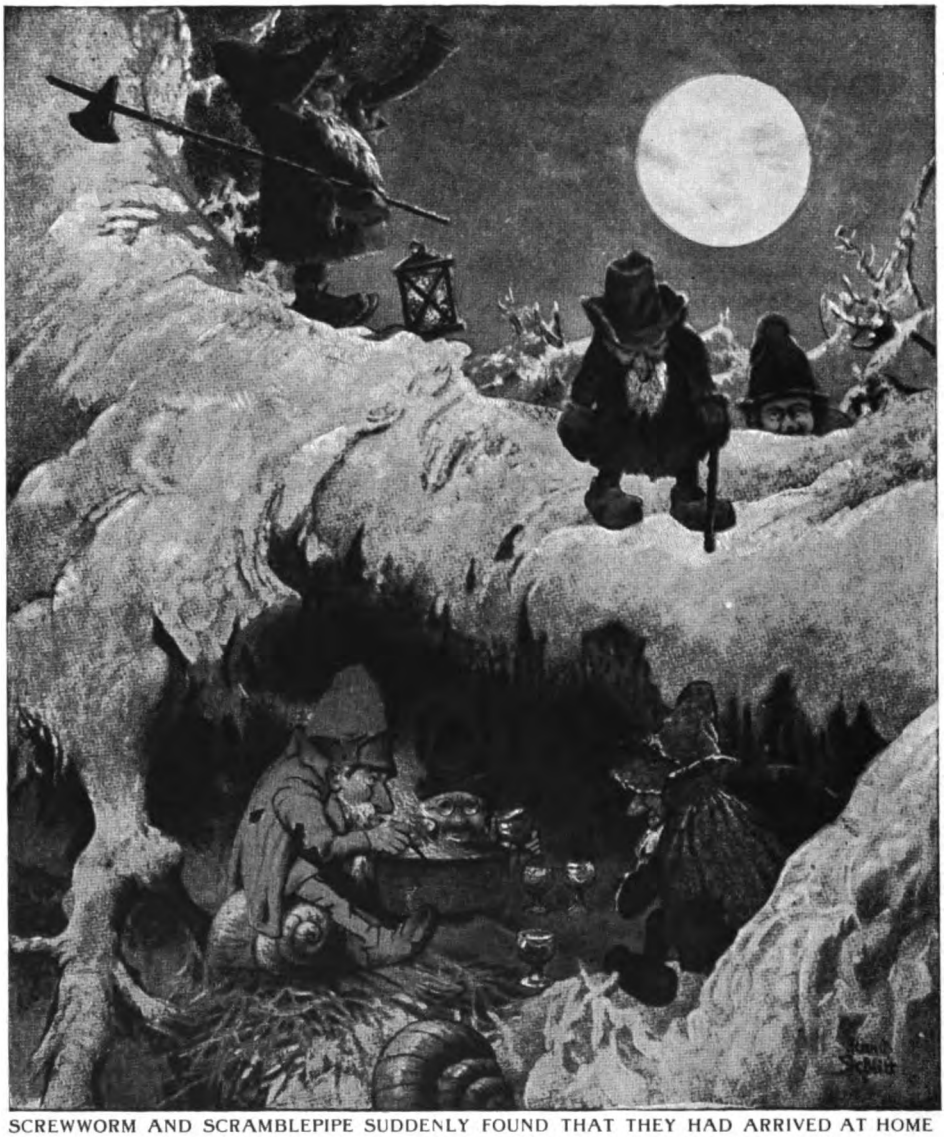
One day they arrived at a place where snow was falling. Their eyes shone with enthusiasm as they saw it.

"I feel," said Screwworm, "like a king approaching his coronation. Columbus discovering America is not nearly big enough for my feelings."

Above this white earth the sky was glittering with stars. An immense moon shone through the trees.

"The moon looks very different," said Screwworm.

"There's no man in it, for one thing," said Scramblepipe; "it smells different."



SCREWWORM AND SCRAMBLEPIPE SUDDENLY FOUND THAT THEY HAD ARRIVED AT HOME

"I never saw such a splendid country in my life!" exclaimed Scramblepipe.

"You can feel the very air is Christmas, can you not?"

"I can smell it!" cried Scramblepipe, with enthusiasm.

They travelled on. Night fell. The whole earth was buried under snow.

They travelled on and on until suddenly they heard a horn blow in the distance.

Screwworm fell on his knees. His face was dazzled with ecstasy. He waved his arms above his head.

"My idea!" he exclaimed. "My idea! I thought of it! Alone I got it! Oh, what it is to be a thinker!"

Scramblepipe cried:

"It is the horn of Christmas!"

Screwworm rose.

"This night the dream of my existence is realised. We have penetrated into the unknown. We have conquered Time. We are in the very land of Christmas!"

The horn blew again.

"Santa Claus is calling us!" said Scramblepipe.

They went on with joy.

"Think, Scramblepipe, think of that foolish Burrowjack, sitting on a toadstool and waiting, *waiting* for Christmas to come to him!"

They rubbed their hands and laughed.

At last, they came to the place from which the horn had sounded. They started and turned a little pale.

"I seem to know this spot," said Scramblepipe suspiciously.

Screwworm admitted:

"It certainly has a miserably familiar look about it."

"Why," cried Scramblepipe, "it's old Cuddledick blowing the horn!"

"It certainly looks like it," said Screwworm, whose face was green.

"My dear old boy," exclaimed Scramblepipe suddenly, "do you know where we are?"

"I do."

"*We are at home!*"

"Too true!"

"Home—in our own land, in our own country, in our own territory, in our own neighbourhood!"

They entered the cave, and sat down.

"Hallo!" said Burrowjack. "Where have you been? Oh, I forgot! You've been to Christmas. How did you find the old gentleman?"

"Gentlemen," said Screwworm, "I and Brother Scramblepipe have been upon a scientific exploration. We have made an amazing discovery. I will tell it you."

"Not at Christmas! Not at Christmas!" pleaded all the gnomes, holding their heads. But Screwworm heeded not their pleading.

"Gentlemen," he said, solemnly and mercilessly, "the World is Round!"

THE KING, THE NOBLEMAN, & THE PEASANT

It came one day to the ears of Louis XII. of France that a certain nobleman had very brutally chastised a peasant. As the king was called "Father of his people," and was truly beloved by all his subjects for the great benevolence of his heart, it can be imagined how this story would vex and distress him. He determined to teach the nobleman a lesson as to how he should treat those who were less fortunate than himself. But he kept this purpose secret. For several weeks he considered the matter, and at last he hit on a plan which he thought would be effectual.

One day he invited the nobleman to his palace, and kept him to dinner. He did not himself dine with his guest, but he ordered the most magnificent banquet imaginable to be served to the lord. Everything good to eat that you can possibly think of was placed on the gorgeous table, with the single exception of bread, which, by the king's express command, was not placed there. The nobleman was, of course, very much surprised by this strange omission, but he dared not, out of courtesy, ask for so small and common a thing with so many rare and delicate dishes spread before him. But, of course, as the banquet progressed, the more did he feel the lack of bread, till towards the end of the feast he was almost enraged by the absence of such a necessary thing.

At this moment the monarch entered the hall.

"My lord," said the king to his guest, "have they provided you with good fare?"

"Sire," answered the nobleman, "they have served a superb feast, a feast fit for a king. And yet, notwithstanding that, to tell your Majesty the truth, I do not seem to have dined well; for, in order to live, bread is necessary, and of bread at this banquet there was none."

"Go," responded Louis XII. in a tone of great severity; "and therefore shall you the better understand the lesson I desired to impress upon your heart. As you need bread, my lord, in order to satisfy yourself, learn at least to treat with common humanity those whose labour it is to make it grow that you may be supplied."

LEGENDS OF PLACES IN ENGLAND

THE FAIRY OF THE NEW FOREST

ONE midsummer's eve an old woodcutter was trudging back to his hut in the New Forest, with a small, empty sack on his arm he had carried a few cents' worth of firewood in it to a distant farm, and as he approached his hut he began to complain aloud of his unhappy lot. Suddenly a beautiful little lady appeared, and said:

"Now, would you really be content if I filled that sack with gold for you?"

"Yes, lady," said the woodcutter.

The beautiful little lady touched the sack, and it became filled with gold. The woodcutter lifted it on his shoulder, and then he put it down, saying:

"But wait a minute! I have a larger bag at home."

But when he ran to fetch it the beautiful little lady touched the sack again, and when the woodcutter returned he found that the gold had been changed into yellow moss. So he was sorry he had not been content with what the lady had first given to him.

FOR A YEAR AND A DAY

THE Forest of the Yew-tree is an enchanted wood in the parish of Llanwrin. As a lad and lass were strolling there one evening, they saw two elves come and draw a fairy ring round the yew-tree. A troop of fairies then entered the ring, with their musicians, and began to dance. They danced so well that the lad joined them, and went whirling round the fairy ring, while the lass sat and watched them.

But hour after hour went by, and the lad still danced, and at daybreak he and the fairies vanished together, and the lass went home feeling lonely and broken-hearted.

One evening, as she was looking for him in the forest, she met an old woman, who told her to wait for a year and a day, and then return at night to the yew-tree. The lass did so, and there she saw her sweetheart still dancing merrily with the fairies in the fairy ring. She went as close up to him as she could without getting into the enchanted ring, and tried to drag him out of it.

"Just let me dance another minute," he cried, eagerly pushing her aside.

"No, you've danced long enough," she said, and she seized him by the arm and pulled him away from the ring.

"I haven't been dancing five minutes!" he said, rather angrily.

And it was not until he got back to Llanwrin that he believed that he had really danced for a year and a day.

THE CAULD LAD OF WILTON HALL

THE Cauld Lad of Wilton Hall was an elf with pointed ears and hairy skin, and he was the most mischievous thing that ever lived in a house. He used to get up when everybody was in bed, and play pranks in the kitchen. All sorts of ways were tried to lay him, but none succeeded, and he went about singing:

"The acorn's not yet fallen from the tree
That's to grow the wood, that's to make the cradle,
That's to rock the bairn, that's to grow to the man,
That's to lay me."

But one night the kitchen-maid left a little cloak and hood for him, and he put it on, saying:

"I've taken your cloak, I've taken your hood;
The Cauld Lad of Wilton will do no more good."

And with that he vanished, and was never seen any more in Wilton Hall.

THE DRAGON OF ST. LEONARDS

THERE are two strange things about St. Leonards Forest, in Sussex: no nightingales sing there, and more lilies of the valley grow in it than in any other forest or wood. All this is St. Leonard's doing.

St. Leonard was a soldier who wearied of war, and returned to the forest to live as a hermit. But, finding there a fierce dragon, he resolved to have a battle with the monster before laying his sword aside. So he knelt down to pray for victory. The nightingales disturbed him with their singing, and he said:

"Go away!"

And they went away, and never returned. Then St. Leonard seized his sword and attacked the dragon, and, after a fearful struggle, he killed it. But he was grievously wounded, and, wherever his blood fell to the earth, the earth broke out into blossoms of white and beautiful lilies of the valley.

THE NEXT STORIES ARE ON PAGE 3847

A THIRD TALK ABOUT TREES

A TREE AND THE WORLD'S LIFE

CONTINUED FROM 3453

Most people know that trees are beautiful things. A great many people know that they are useful things. But few people, perhaps, realise that trees are absolutely essential to existence. History, indeed, is an arm-in-arm march of Man and Forest. Not only would man never have been able to advance from savagery without trees, but without trees he could not have even been a savage. He could not have been at all.

Have we ever realised that in some senses the tree is the father of humanity?

Directly we begin to think, a hundred things jump into our minds which show us the immense importance of trees. We see that an express train, rushing with a great clatter of iron and steel across the earth, is a forest in motion. The carriages were hewn out of the forest; the seats on which the passengers sit, the floor on which they rest their feet, the roof which protects them from the changes and chances of climate, were once trees growing in the kindly sun and rooted fast in the earth.

Not only this, the iron and steel which make such a pompous clatter, as though they were doing all the work, could not have taken their part in the advance of humanity without fire, and without trees there could be no fire. The steam shrieking from the whistle, the smoke drifting from the funnel, the sparks whirling up into the air, were once trees. Every spark was once lodged in a tree, every gas was once buried in a tree, every lump of coal was once hidden in a tree. The death of the forest is the birth of the coalfield, and out of the coalfield leaps the genie called Progress, man's helper and salvation, in her robe of fire.

Let us turn away from the train, and wherever we look we shall see the same energy and activity of the forest. Our houses are cut, like saplings, from the forest. When we throw up our window we lift a branch, when we open our door we move a tree. We cross the room, we are trampling the forest. We sit, the forest supports us. We write, it is still the forest that serves us. It is cold; we will have a fire; the forest lights it. We are hungry; let us eat; the forest cooks our meal.

There is not a traffic of the human race, not an art, not a science, not a comfort, and not a beauty which does not issue from the heart of a tree. Strange, too, is it that the

centuries of man's existence are divided by a tree, on one side the centuries before, and on the other the centuries after, the Cross of Christ. If we cross the desert of Sahara we find ourselves ploughing through an ocean of sand. Nothing will grow there. It is a dead land, profitless, empty, appalling. Now, the whole earth would be one hideous Sahara but for trees. And Sahara would not be a desert if it were covered by greenwood. The earth is what it is according to the presence or the absence of trees.

THE FORESTS THAT FORM AN UMBRELLA TO SHADE THE EARTH FROM THE SUN

Forests present to the sun an immense umbrella. They shield the soil from rays which would otherwise burn up into smoke-like dust the rich pastures of the earth's surface. Herbage, which grows under the shelter of this immense umbrella, is itself a form of sunshade, as it were, a doll's sunshade; it seeks to imitate the mighty forest by protecting the soil from the rays of the sun. Without trees the richest soil would soon perish and become a desert of sand.

For not only do forests intercept the scorching rays of the sun, driving them back from the earth, they also preserve the springs at their roots from the thirsty greed of those rays.

All the countries along the lovely Mediterranean Sea—Turkey, Italy, Spain, and France, though still beautiful in their colouring, and so pleasant in winter that people flock to them from all parts of the world, are, nevertheless, the ruin of what they once were.

Once upon a time these lands were fertile to an unusual degree, with plenty of springs to give them water for man and beast, and to give life to their crops. But the axe was laid to the root of the tree; the mighty forests covering those splendid mountains, and looking so useless and idle, were cut down.

HOW THE CUTTING DOWN OF THE TREES HAS DRIED UP THE EARTH

The result soon showed itself. The land grew sulky. The springs dried. Only in certain places was it possible for man to scrape together a living. We may now walk for a whole day along the Riviera without seeing a single bird. Far worse than the case of the countries bordering the Mediterranean is the case presented by the condition of British India. When we read of a terrible famine ravaging that mighty continent like a wolf, sweeping away the inhabitants as if they were so many flies, we should remind ourselves that man's folly is the cause of this appalling havoc.

Once the mountain slopes of India were covered by magnificent forests; they were cut down and sold for money. The people did not realise that God makes a thing useful as well as beautiful. The beautiful trees, hewn down as a revolution hews down the gilded idlers of society, were in reality the most useful servants of India. It was those idle-looking trees which, in the blessed season of rain, drank up at a million million mouths the precious drops of moisture, and stored them up for that dread of India—the sunny day. Now, when the rain falls, there are few forests to catch it; the drops strike the earth, sink in, or slide to the rivers, and away they go to sea—water running away from a parched and arid land. The great forest was India's water-tap.

THE ENORMOUS VALUE OF TREES TO THE EARTH AND TO MAN

Trees, then, we see, not only do service to the soil, and not only preserve for our use the springs of water, but they also affect climate. The climates of countries are very largely influenced by the presence or absence of trees. Humboldt, the man of science, has summed up the service rendered by forests under three heads: (1) They screen the soil from the heat of the sun's rays; (2) their leaves offer an immense surface to the cooling process of radiation; (3) their leaves give off an incalculable evaporation of moisture.

From trees we get coal and materials for buildings; we get also valuable drugs, gums, dyes, and articles of food. But, above all these things, it is important to remember that trees influence the air and the soil of the country; that they oppose their quiet strength to the great enemies of our race—extreme heat and extreme cold; and that they have an all-important bearing on the hidden springs of the earth.

We should cultivate in ourselves a love for trees, and look upon them with something more than mere admiration.

THE WALNUT, "THE FOOD OF THE GODS"

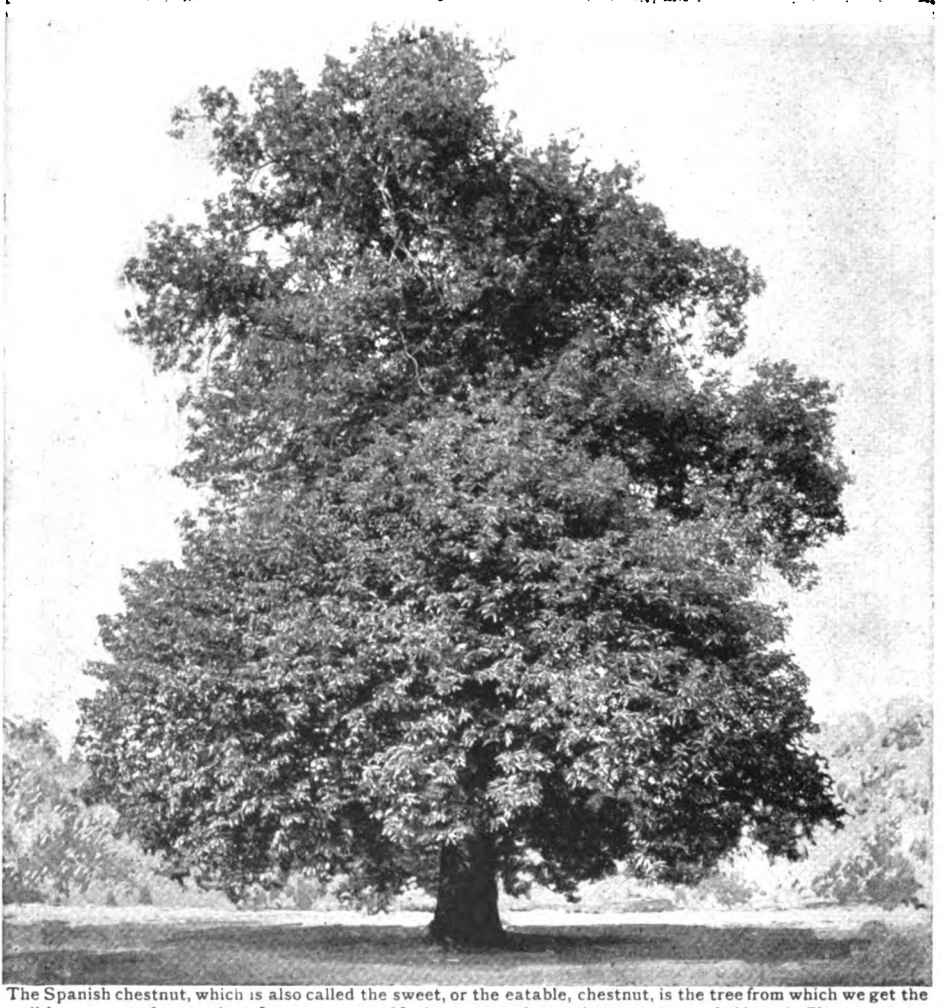
These long, graceful catkins are the male flowers of the walnut, but the female flowers are small and insignificant. Three of them can be seen on the lower shoot.

The leaf of the walnut is divided into numerous spear-like leaflets. In Germany, no young farmer used to be allowed to marry until he had planted a number of walnut-trees.

In the olden times, when men used to eat acorns, the walnut was called "the food of the gods," and its Latin name means "Jove's acorn." During the wars with Napoleon, walnut wood was much used for the stocks of guns, and this led to the cutting down of many of the finest walnut-trees. In those days some trees sold for as much as $5,000

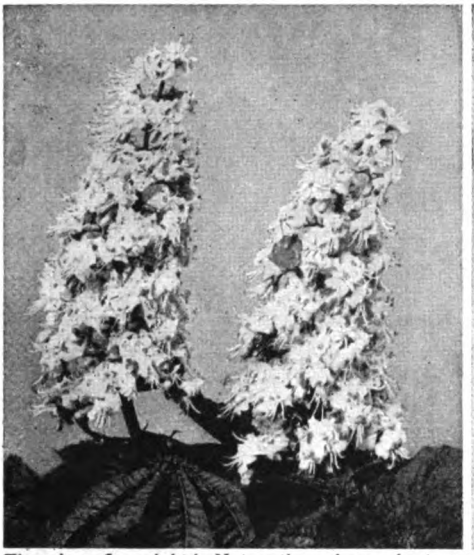
THE CHESTNUT, THE FOOD OF THE POOR

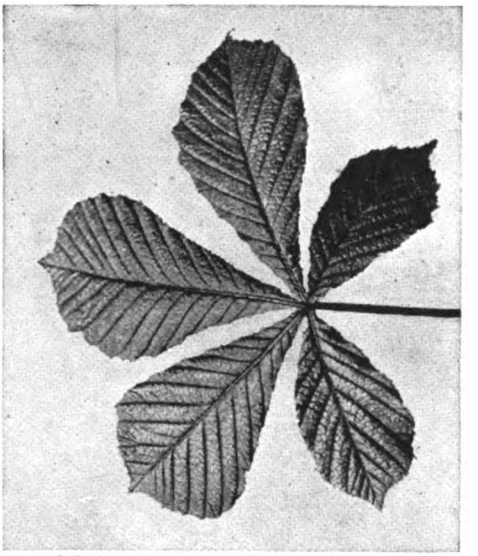
The handsome, glossy leaves of the Spanish chestnut, which are nine or ten inches long, change in autumn from a rich green to golden yellow, and then to brown, and when they fall they greatly improve the soil. The yellow flowers are small, but appear striking as they grow together. Their strong odour is offensive to many people.



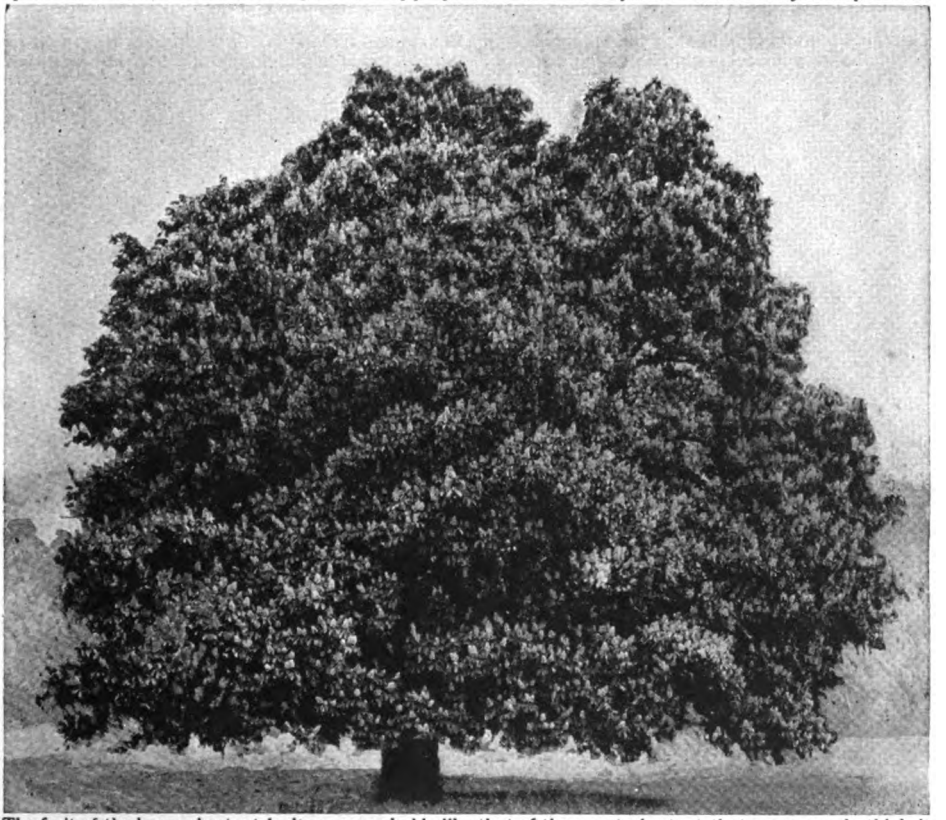
The Spanish chestnut, which is also called the sweet, or the eatable, chestnut, is the tree from which we get the well-known nuts for roasting. In some parts of Italy poor people eat chestnuts instead of bread. Chestnut-trees grow to a great age. There is one at Tortworth, England, called "the great chestnut" in King Stephen's reign.

THE HORSE-CHESTNUT'S SILVER FLOWERS





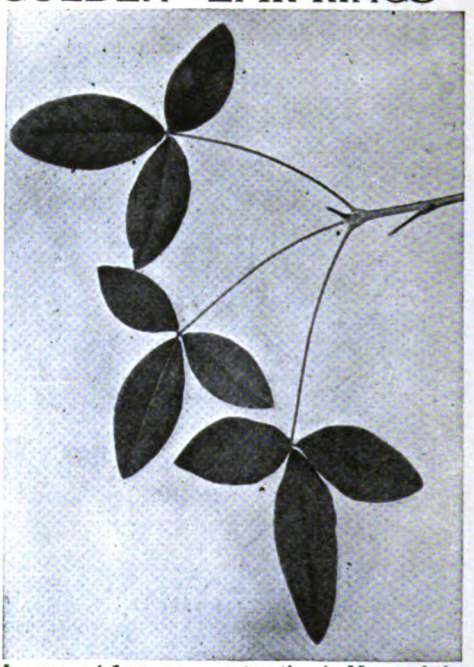
There is no finer sight in Nature than a horse-chestnut tree in full bloom, and thousands of people go every year to see the horse-chestnuts in Bushey Park, near London, when they are flowering. The leaf of this tree is split up into leaflets, and these are so large that many people think that each separate leaflet is really a complete leaf.



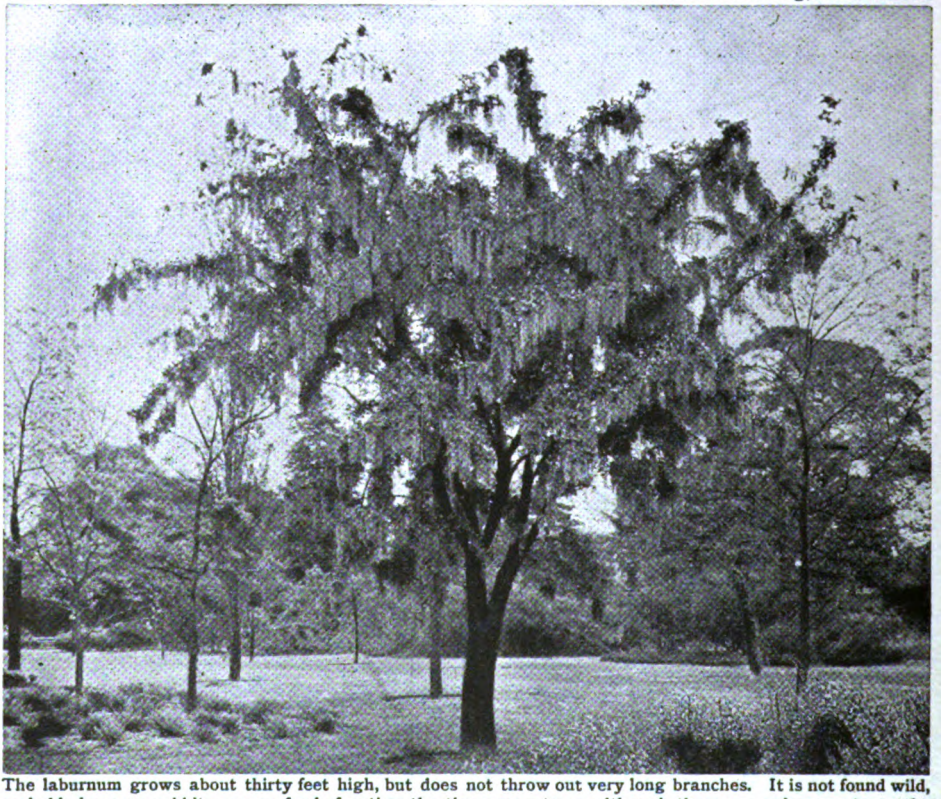
The fruit of the horse-chestnut looks so remarkably like that of the sweet chestnut that many people think it is a variety of that tree. But, as a matter of fact, the two trees belong to entirely distinct families, and, from a scientific point of view, the fruits are not at all alike. Here we see a horse-chestnut " in all the richness of its **heavy velvet drapery, embroidered over with millions of silver flowers," as a writer has picturesquely described it.**

THE LABURNUM'S GOLDEN EAR-RINGS

There is no prettier sight than the laburnum with its clusters of yellow flowers, like golden ear-rings.

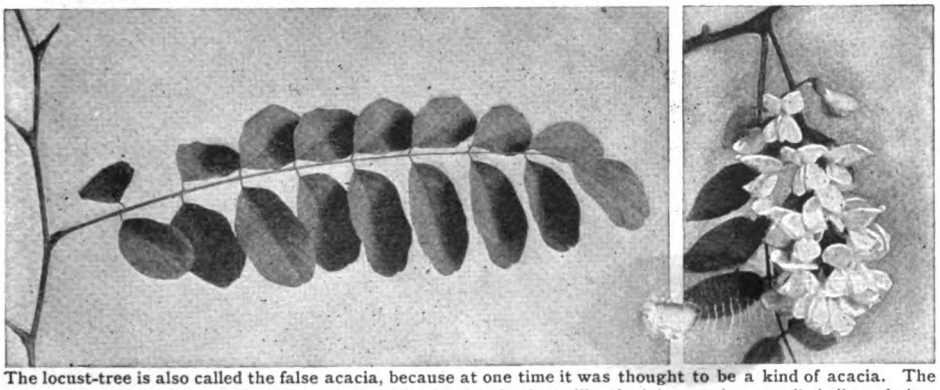


Leaves and flowers appear together in May, and the leaflets form in threes at the end of long, slender stalks.

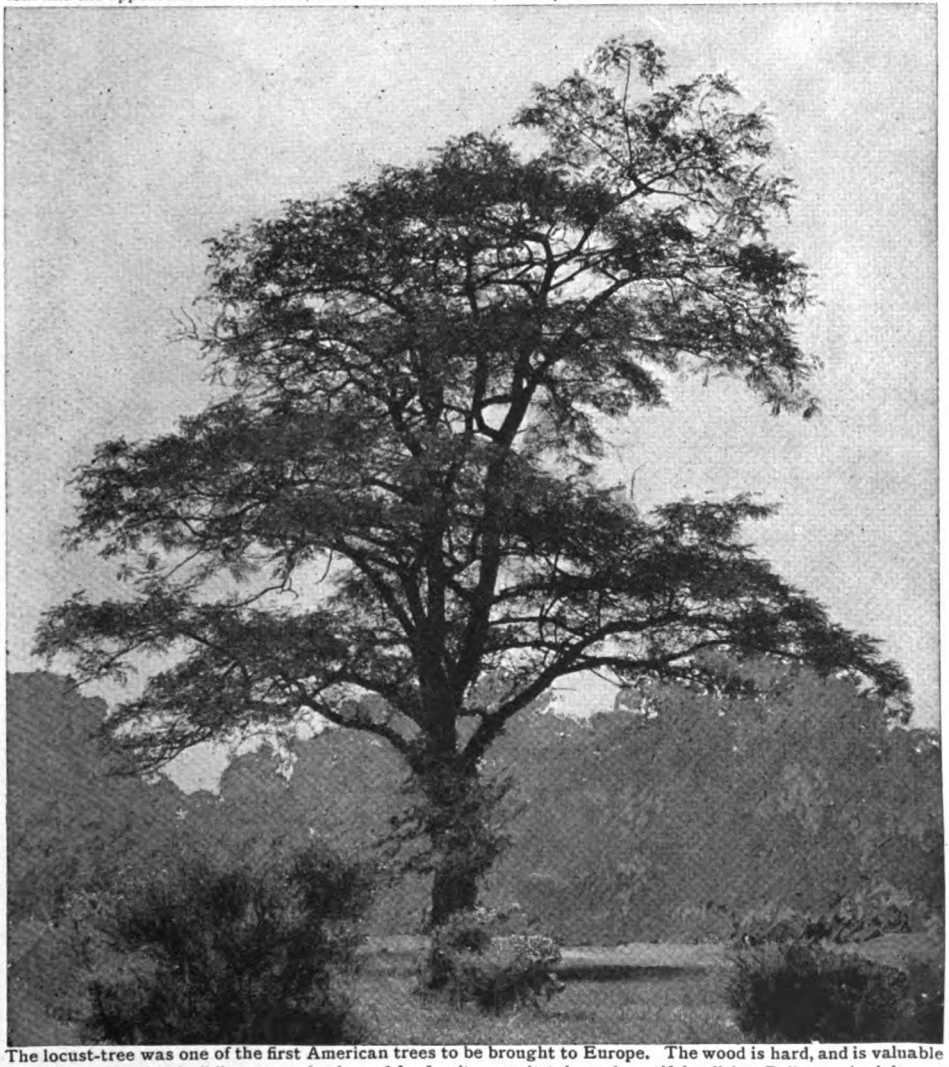


The laburnum grows about thirty feet high, but does not throw out very long branches. It is not found wild, probably because rabbits are so fond of eating the tiny young trees, although these are poisonous to cattle.

THE LOCUST-TREE'S SILVER CHAINS

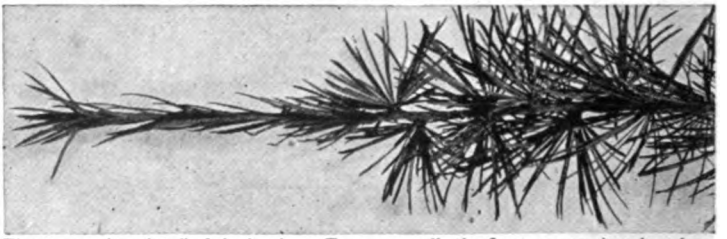


The locust-tree is also called the false acacia, because at one time it was thought to be a kind of acacia. The leaf has the appearance of a feather, and the white flowers, in shape like the laburnum's, are called silver chains.



The locust-tree was one of the first American trees to be brought to Europe. The wood is hard, and is valuable for fence-posts, ship-building, cog-wheels, and for furniture as it takes a beautiful polish. Policemen's clubs are also made from it. The tree grows rapidly, but is often attacked by insects. It reaches the height of 75 feet.

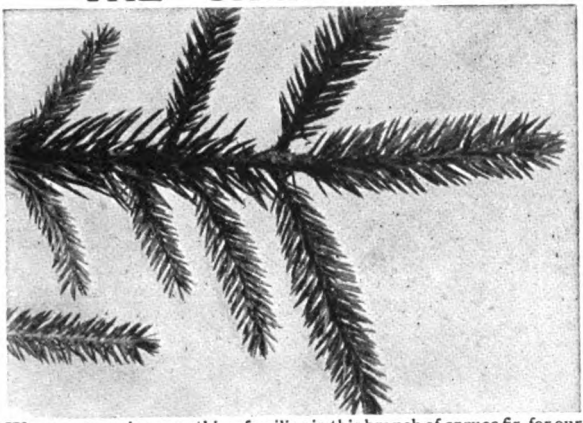
THE GREEN PYRAMID OF THE MOUNTAINS



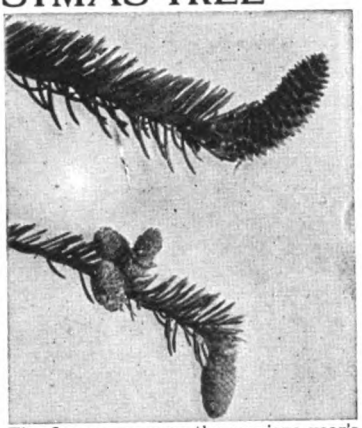
The "rosy plumelets" of the larch, as Tennyson calls the flowers, vary in colour from pink to purple, though they are usually of a reddish-purple hue. The leaves grow in tufts; but, unlike all other trees that bear cones, the larch loses its leaves in winter.

The larch is the tree of the mountains, and in the Alps forests of larch grow 6,000 feet above the sea. A Duke of Atholl, who made experiments in larch growing, planted 27,000,000 larch-trees in Scotland. The tree becomes a fine green pyramid a hundred feet high, and the wood, being very durable, is used for telegraph poles.

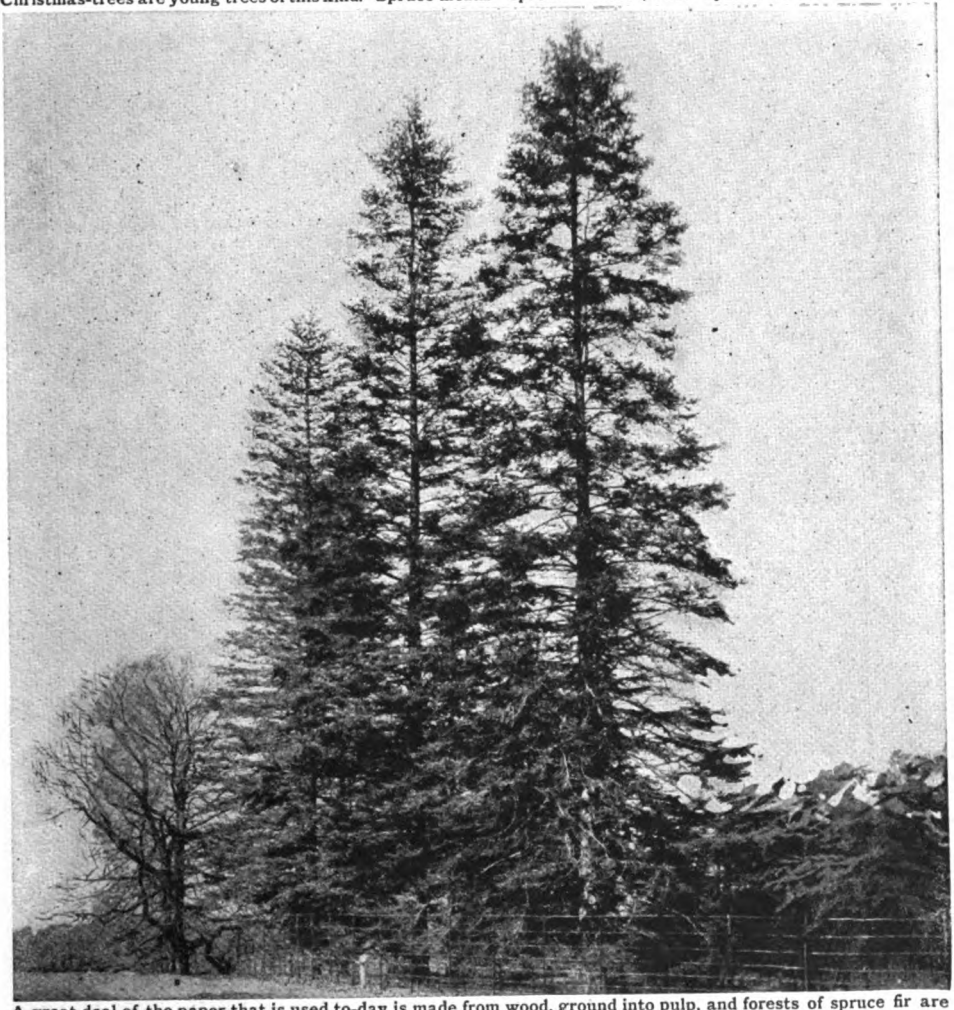
THE CHILDREN'S CHRISTMAS-TREE



We can recognise something familiar in this branch of spruce fir, for our Christmas-trees are young trees of this kind. Spruce means "sprout."



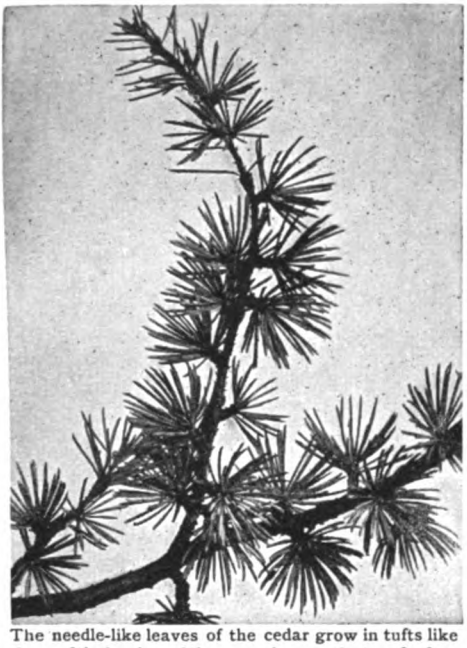
The flowers grow on the previous year's shoots, and ripen after twelve months.



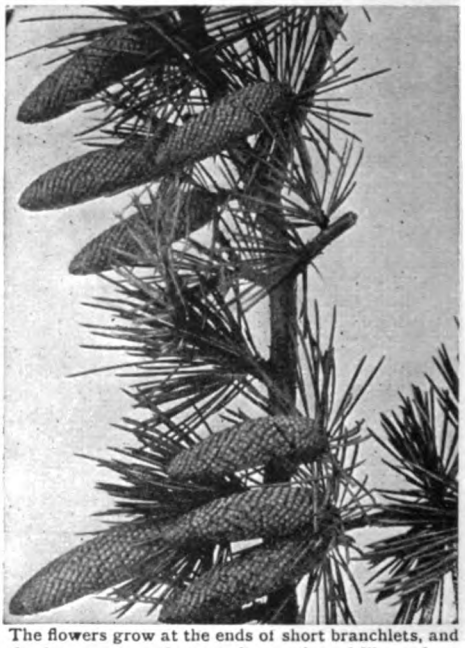
A great deal of the paper that is used to-day is made from wood, ground into pulp, and forests of spruce fir are grown for this purpose. It is a tall, graceful tree, and is one of the oldest of all our forest trees, for remains of it have been found among the fossils. This tree is frequently wrecked in gales, as its roots do not strike deep.

The photographs on these pages are by Henry Irving.

THE CEDAR, "THE GLORY OF LEBANON"



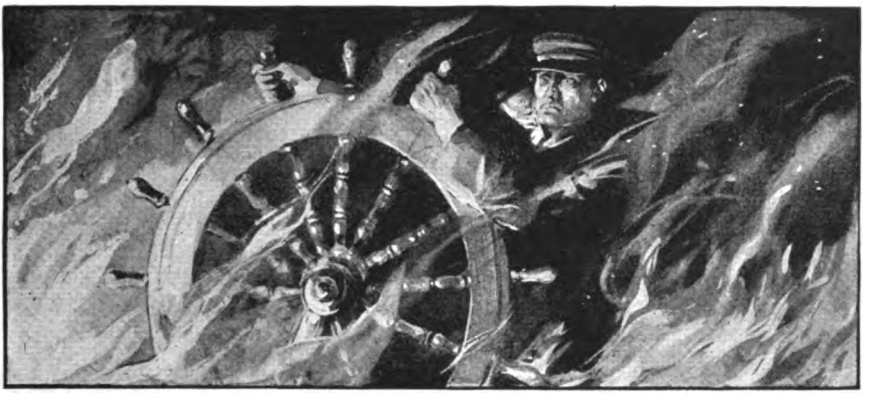
The needle-like leaves of the cedar grow in tufts like those of the larch, and they remain upon the tree for four or five years. These leaves are about an inch in length.



The flowers grow at the ends of short branchlets, and the brown cones that result are shaped like a plum. They remain on the tree for several years before falling.

All kinds of superstitions have grown up round the cedar, "the glory of Lebanon," as Isaiah calls it. One is that the Cross was made of cedar wood, but there is no evidence of this. The name cedar means "power," and refers to the strength of the wood.

THE NEXT PICTURES OF FAMILIAR THINGS ARE ON PAGE 3765



JOHN MAYNARD, PILOT

CONTINUED FROM 3554

In thick darkness the great steamer was creeping through dangerous but smooth waters towards the end of her journey. The passengers and most of the crew were asleep in their berths. The captain was taking his well-earned rest in his cabin. On the bridge was the pilot, a man named John Maynard, who had left his wife and the son whom he loved much better than his own life, to bring this great ship safely into harbour.

It was one of those dark nights at sea when it is impossible to catch a glimpse of the vast ocean through which ships make their way. Not a star shone in the sky. The little discs of light made by the portholes perished in the wall of darkness enclosing the ship. The only sounds in the darkness were the grinding of the paddles, and the deep, low murmur of the smooth sea.

So smooth, so gentle was the ocean, that none could dream of disaster. It was a fitting night for the end of a dangerous voyage, for the peace and rejoicing of a home-coming.

But, of a sudden, a terrible cry arose above the sea—a cry of "Fire!"

Gone now was the darkness. Every face was visible. Every line of terror could be seen in that frightful glare. And another sound was added to the moan of the sea and the noise of the paddles—the rushing, roaring, hissing sound of fire that leapt in a writhing cloud of sparks to the sky.

The captain cried out in a loud voice: "Listen! In ten minutes more we shall have reached land. Our lives may yet be saved. It rests with the pilot. If he can hold on at his post we shall reach the land." He turned around, and called: "John Maynard, are you there?"

A quick answer came from the bridge: "Ay, ay, sir!"

In an instant, despair was turned into hope. That answer was so strong, so sure, and it had come so quickly. Only ten minutes. They were saved! John Maynard could see laughing women kissing their babies, and fathers smiling into the eyes of their sons.

The great ship, now a driving shape of flame, cut through the smooth and dangerous water at its highest speed, a race against fire!

Would they reach the land in time? With every turn of the paddles they were nearer to safety; but with every *second* the flames increased in fierceness.

What of the pilot? Was he still safe at the wheel?

"Are you there, my lad?" cried the captain.

There was no answer.

The passengers felt their hearts sink, and a new terror possessed them.

But, just as they abandoned hope, the answer came—so slow, so choked, so difficult, that it was hard to believe that the same man spoke.

"Sir, I'll try," said John Maynard.

The thoughts of the passengers, at that instant, were turned from the faithful pilot. The lights on land suddenly stood out before them in the distance. A loud cheer ascended from the decks. They were saved. The race against fire had been won. Land was near; houses were visible; the towers of churches, the names of shops, and the lamps in the street came into view. Boats could be seen putting out to them.

John Maynard, from the bridge, could see mothers clutching their children to their hearts. His own little son, his well-beloved, was asleep at home, far away. The moving mass of roaring flame, which once had been a ship, reached the harbour.

Passengers threw themselves into the waiting boats. Not a thought was given to the pilot. On the sides of the harbour was gathered a dense multitude, watching the spectacle of a great ship on fire.

When everyone was saved, the boiler exploded with a deafening roar, and John Maynard was hurled into eternity.

Many men who stood on that flaming deck remembered to their dying day, as the most vivid impression of their life, the look on John Maynard's face as he held to his post in the blinding smoke and the fiercely raging fire.

A POACHER'S SILENCE

Some thirty years ago a gamekeeper was killed in the East of England, and two poachers were arrested for the crime and brought to trial. There was no difficulty as to which of the poachers was the guilty party. One of the men confessed that he and he alone had done the horrible deed. But for some reason or another there was a general feeling that he was innocent, and the trial excited very great interest. When the verdict was given, and the judge had pronounced sentence of death, the friends of the prisoner bestirred themselves, and, raising the plea that he suffered from a deformity of the neck which would make it a torture to hang him, they succeeded in getting a respite.

But, after the respite had been granted, the law ordered a medical examination of the prisoner, and none of the doctors could find any reason why he should not meet the punishment for his crime. He was, therefore, for the second time condemned to death. But the people in his part of the world were utterly unconvinced that he was guilty, and immediately set about getting up fresh petitions for his reprieve. So numerous and so earnest were these petitions that the law again granted a respite, and the poacher was sentenced to penal servitude for life.

Think what those words mean—"penal servitude for life." They mean that a man ceases to be a man, and becomes a number; that every to-morrow is the same soul-killing monotony as yesterday; that no friend may come near him; and that the life of the world is shut out from him by frowning walls.

Perhaps this poacher many times wished that the law had put him to death, for he lay in prison day after day, week after week, month after month, for nearly thirty years. Then he was released. He went into prison a strong and vigorous man, with dark hair, bright eyes, and ruddy skin; he came out white and bowed, and marked for ever with the grey pallor of the prison cell.

And when he came out and found that his fellow-poacher was dead, he told the story of his crime. It was not he, but his fellow-poacher, who had killed the keeper—struck him down with the butt of the gun, and thrown the body into a pond. He himself had had no hand in the crime. But why did he take upon himself the guilt? Why did he twice hear himself condemned to be hanged, and then for nearly thirty years of awful torture hold his peace? The answer shows us that even in bad men there is a soul of goodness. This rough English poacher held his peace because the real murderer was a married man with a wife and children dependent upon him for support. He himself was unmarried. And so, for the other man's wife and children, this simple, rough-hearted poacher did what he could, and offered his life.

The next Golden Deeds are on page 3789.

THE STORIES OF CHARLES KINGSLEY

CHARLES KINGSLEY wrote "Westward Ho!" mainly, as he says himself, to commemorate those early days of England's naval and commercial glory, when, under the wise rule of Queen Elizabeth, England's enterprise was spreading and taking root in distant seas and distant lands. Spain was the most powerful of European nations at that period, and her ambition was to be mistress of the world, especially of England. But England's seamen, chiefly the men of Devon, put an end for all time to such designs when they routed the great Armada in 1588. Kingsley was himself a Devon man, so it was natural that he should make his hero a Devonian. His story of Devonshire worthies and their Spanish foemen is as lifelike as anything in the whole range of historical fiction—hearty, English, Protestant, free, strong, and tender. It reveals in a peculiar way the English Protestant hatred of the Spanish Jesuit, but here the story is "the thing."

WESTWARD HO!

CONTINUED FROM 3609

THE hero of our tale is a certain Devonshire youth named Amyas Leigh. We meet him first in his native Bideford, that little white town standing so pleasantly among the beautiful scenery of North Devon, beneath its soft, Italian sky, fanned day and night by the fresh ocean breeze. In the days of our story, Bideford was one of the chief ports of England. It furnished seven ships to fight the Armada; and even more than a century afterwards, as the old historians tell us, it "sent more vessels to the northern trade than any port in England, saving London and Topsham."

It is to the sea life and labour of Bideford, and Dartmouth, and Topsham, and Plymouth—then a very insignificant place—and many another tiny western town, that England owes the foundation of her naval and commercial glory. It is the men of Devon—the Drakes and Hawkins, the Gilberts and Raleighs, the Grenvilles and Oxenhams, and a host more of forgotten worthies—to whom England owes her commerce, her colonies, nay, her very existence. For had they not first crippled, by their West Indian raids, the ill-gotten resources of the Spaniard, and then crushed his last effort in the glorious Armada fight, what had England been now? Not, certainly, that Britannia which proudly boasts that she rules the waves.

Well, Amyas Leigh, being a Bideford boy, saw a lot of sailors and ships, and, being fond of adventure, he longed to go to sea. He wanted especially to see the Indies, and to fight the Spaniards. He said so to a group of weather-beaten mariners whom he came across one fine summer afternoon in the year 1575.

He was just fifteen then, but for some time past, on account of his extraordinary size and strength, he had been the undisputed cock of the school, and the most terrible fighter among the Bideford boys. He was the terror of all the sailor lads, and the pride and stay of all the town's boys and girls, and hardly considered that he had done his duty if he went home without beating a big lad for bullying a little one. For the rest, he had no ambition beyond pleasing his father and mother, who were of gentle blood, as the saying is, and going to sea when he was old enough.

As yet, he had said nothing to his parents about his darling wish. But now, when Captain John Oxenham, the leading speaker in the above-mentioned sailor group, told of his purpose to fit out a ship to go in search of treasure in the West, and invited recruits, Amyas decided that his parents must know of his desire. It was arranged that Oxenham should come to a little supper, and broach the matter to the Leighs. Sir Richard

Grenville was there too—that same hero who fought the Revenge against such terrible odds, as we know from all the naval histories, and from Tennyson's stirring poem on the subject.

OUR HERO GOES TO SCHOOL WITH A PROMISE OF ADVENTURE

The Leighs were naturally opposed to their boy going to sea so early, especially as his elder brother, Frank, was already far away in a foreign land. They made their appeal to Sir Richard, who himself talked to the boy.

"Come, now," he said to Amyas. "I will make you a promise. If you bide quietly at home and learn from your father and your mother all which befits a gentleman and a Christian, as well as a seaman, the day shall come when you will sail with Richard Grenville himself, or with better men than he, on a nobler errand than gold-hunting on the Spanish Main."

And thus Amyas Leigh, cheered by the prospect here held out to him, went back to school; while Mr. Oxenham proceeded to Plymouth without him, and so off to the boundless West, never more to be heard of, as it turned out.

But one never knows what a restless, adventurous youth with the sea-call in his ears will do. Amyas Leigh did not remain long at school. One day the master, Sir Vindex Brimblecombe, having reprimanded him, received from the pupil a smacking blow with a slate on his bald head. When Vindex recovered sufficiently, Amyas had to be switched. Amyas did not like it, so he went straight away to Sir Richard Grenville to take counsel with him about the sea project. Amyas had lost his father by this time, and Grenville had, in a manner, taken the father's place.

AMYAS SETS OUT FOR THE SPANISH MAIN UNDER SIR FRANCIS DRAKE

It was quite clear to Sir Richard that nothing was to be done now but let Amyas have his way. So Amyas presently found himself riding joyfully towards Plymouth by the side of Sir Richard, and being handed over to the famous Captain Drake, whose name was already, by reason of his pirate adventures, the terror of the Spanish Indies.

Three years passed, during which Amyas Leigh was not seen in his native Bideford. He had been round the world with Drake—literally round the world. In those days that was an achievement something like what we would regard the finding of the North Pole now. So when Amyas and the other Devon men who had been with him returned in safety, Bideford held a public thanksgiving, made a holiday for the occasion, and had its streets turned into a very flower garden of all the colours, swarming with seamen and burghers and burghers' wives and daughters, all in their holiday attire. That was how Amyas Leigh came home the first time. As they saw him in the church, he was still a beardless boy, yet with the frame and stature of a Hercules; like Saul of old, a head and shoulders above all the congregation, with his golden locks flowing down over his shoulders. He would have good use for that strength and that figure by-and-by, as we shall see.

HOME AGAIN FROM HIS FIRST VOYAGE OF ADVENTURE, AMYAS FALLS IN LOVE

Meanwhile, he had fallen in love. The lady was Rose Salterne, the Mayor of Bideford's daughter, a beautiful girl of eighteen, about whom the half of North Devon had gone crazy. Amyas had a rival in his brother Frank, now at home, a tall, slim fellow of twenty-five. And he had a rival, too, in his cousin Eustace, a religiously inclined person, who had been Papist and Protestant in turn, like the Vicar of Bray celebrated in song, but who now, in the reign of Protestant Elizabeth, was finally settled in the older faith. Eustace got the length of proposing to Rose, but Rose rejected him. She was a thorough specimen of a West-country maiden, full of passionate, impulsive affections, and wild, dreamy imaginations—a fit subject for all romantic and gentle superstitions. She had no wish to break hearts; but her admirers were all very charming, and no one of them was very much better than the others. So she kept them all dangling, as it were, and Amyas Leigh had no more favour with her than the rest, notwithstanding that he *was* so madly in love.

But, in truth, Amyas had more serious work on hand than love-making, as we shall see presently. Just now he had to help, with Sir Richard Grenville, in the capture of some intriguing Jesuits. And then came an entrancing experience when, in Grenville's presence,

BACK FROM THE SOUTHERN SEAS

In this fine picture by Edgar Bundy, R.I., we see an English sailor returned to London after his many adventures in the Southern Seas and the Spanish Main, where he has been a captive of the Spaniards. He is relating his adventures to a company of English gentlemen engaged in the business of foreign trade and adventure. Though not drawn to illustrate "Westward Ho!" the picture is clearly suggested by that story

This picture is from the painting by Edgar Bundy, R.I., by permission of the artist.

he listened eagerly to "the true and tragical story of Mr. John Oxenham," as told by Salvation Yeo. Salvation Yeo makes a great figure in our tale. He was a tall, gaunt fellow, with a florid, black-bearded face. Amyas had encountered him long ago among that group of sailors on Bideford Quay. He was then dressed in a suit of crimson velvet. By his side were a long Spanish rapier and a brace of daggers. His fingers sparkled with rings, and he had two or three gold chains about his neck, and large ear-rings in his ears. A man, once seen, to be remembered for ever.

Like Drake, Salvation Yeo was full of the conviction that, in fighting the Spaniards, he was fighting for the cause of freedom, of England, and of God. And, as we shall not mention him again, let us take it for granted that, when he goes out adventuring with Amyas, as he does, he takes a big share in the fighting, and goes through with it in his own sturdy, rough, masterful way.

THE STIRRING STORY TOLD BY SALVATION YEO

And what a story that was he told to Grenville and Amyas! It was all about Oxenham's adventure and his tragic end—for Yeo had gone as gunner on that same expedition in which our young hero had so wished to have a part. Yeo had helped to get the crew of seventy men together. And now, clasping his hands on his breast, he exclaimed to Grenville: "Those seventy men, sir—seventy gallant men, sir, with every one of them an immortal soul within him—where are they now? Gone, like the spray! And their blood is upon my head!" Oxenham had called his men together one day. "I tell you now," he said, "what I forbore to tell you at first, that the South Seas have been my mark ever since I left Plymouth. Such news have I of plate-ships and gold-ships, and what not, all which, with the pearls of the Gulf of Panama, and other wealth unspeakable, will be ours if we have but true English hearts within us." At which, as Yeo confessed, the crew "were like madmen for lust of that gold, and cheerfully undertook a toil incredible." Alas! the Spaniards proved too much even for the brave English hearts. In that exciting hunt for gold and treasure, many of Oxenham's men were slain; some died of hunger and some of disease. Oxenham himself and sundry more were hanged; while Salvation Yeo fell into the cruel clutches of the Spanish Inquisition, to escape by-and-by, and tell that wonderful yarn, which would make a good long story by itself.

AMYAS LEIGH CAPTURES AN IMPORTANT PRISONER, DON GUZMAN

And now we must return to our hero proper. Sailing the Southern Seas was what Amyas Leigh preferred, but if that could not be done he would go fighting nearer home. It was now the year 1580, and the hated Spaniards were menacing Ireland. England had a Protestant sovereign, and the Spaniard wanted to claim Catholic Ireland as the Pope's gift to himself. His plea was that Elizabeth had forfeited her title to Ireland by heresy. Ireland has long had two great struggles, the religious struggle and the land struggle, and just now it was the religious struggle that was distressing that country.

But the Spaniard could not hold his own on British ground against the men of Devon, of whom our Amyas was one. At the end of a severe encounter, Amyas brought in a captive. "He and I," he told his superior, "cut at each other twice or thrice, and then lost each other; and after that I came upon him among the sandhills trying to rally his men. But his men ran, so I brought him in."

Though Amyas did not know it, the prisoner was to play a very important part in his story. His name was Don Guzman. He was a very tall and graceful personage, golden-haired and fair-skinned, with hands as small and white as a woman's. The Don was Amyas's prize by right of war, but where to bestow him was the question.

AMYAS TIRES OF HIS LIFE IN IRELAND AND THIRSTS FOR NEW ADVENTURES

In the end, Sir Richard Grenville, having been communicated with on the matter, agreed to receive the Don as his own guest at Bideford till his ransom should arrive.

Meanwhile, Amyas, now a lieutenant, was left alone among the Irish bogs for two more years. Then, getting utterly sick of Ireland and the inactive life, he came home, determined on some adventure Westward Ho! As it happened, Sir Humphrey Gilbert, most pious and most learned of seamen and of cavaliers,

beloved and honoured above all his compeers by Queen Elizabeth, was just fitting out an expedition for Newfoundland and Labrador, and Amyas went with him as a gentleman adventurer. Away they sailed to the West, the largest ship in the little squadron being only of 200 tons burden, the smallest of 10 tons. In such cockboats did these old heroes brave the unknown seas!

And it was in that small ten-ton boat that Gilbert lost his life. Amyas told the story of the setting sail from St. John's to discover the southward coast; of Gilbert's chivalrous determination to go in the tiniest craft, because she was more fit to examine the creeks; of the storms coming on; and of how at last the Squirrel, for that was her name, was devoured and swallowed up by the sea. The expedition had been an utter failure, and Amyas Leigh, though he had a good share of adventure by it, came home with a sad heart.

WHAT AMYAS DISCOVERED WHEN HE CAME HOME AGAIN, AND HIS NEW RESOLVE

But youth gets over most things, and Amyas got over this disappointment. There was another thing that he did not get over so quickly. He found that, during his absence, his old prisoner, the Señor Don Guzman, had been making love to Rose Salterne, and had finally vanished with her, no one knew whither or in what character, whether as husband or lover. Rose had not yielded to the Spaniard without a struggle. He had pleaded long with her before she agreed to go with him. But gone she was, and that was the point which concerned Amyas Leigh.

These were the days of romantic chivalry, when gallants would go out and fight for distressed ladies, as Don Quixote did. Now, more than one of Rose's disappointed suitors vowed that he would find her and slay the rival who had carried her off. Amyas was chief among them, but there were also his brother Frank, and Will Cary, and Jack Brimblecombe, the parson son of that Bideford schoolmaster whose skull had been so nearly fractured by Amyas. They were all bent on getting at Rose, and getting even with the Spaniard who had found favour in her eyes. Somebody brought the news that Don Guzman had been appointed Governor of La Guayra, on the Caribbean Sea, and had gone there with a lady for company. So, after consultation and long debate, it was decided that a ship should be fitted out and a crew got together, and away they would sail on the romantic expedition; Amyas, who was to be the leader, declaring that, if chance brought the Spaniards in his way, he would fight for his queen as well as for Rose Salterne.

AMYAS SETS SAIL IN THE ROSE ON A ROMANTIC EXPEDITION

Rose's father wanted to be revenged on the Spaniard, too, for the Spaniard had carried off his daughter without his consent. Salterne was a man of means, and it was he who was largely responsible for the cost of the expedition. The ship was appropriately called the Rose. She was of 200 tons burden, and she had a crew of a hundred picked men, for sailors packed close in those days. She carried beef, pork, biscuit, and good ale in abundance, and was liberally provided with all the kinds of ammunition which were common at that time. In fact, when she dropped down from Bideford Quay on November 15, 1583, everybody allowed that so well-appointed a ship had never sailed "out over bar."

This was Amyas Leigh's great adventure, and we must tell about it in some detail. The first land sighted was Barbados—land at last, with fresh streams and cooling fruits and free room for cramped and scurvy-weakened limbs. There the good ship the Rose anchored for four days, to get her sick round, before her crew made for the Main, and set to their serious work.

THE ADVENTURERS AS PIONEERS OF BRITISH POWER IN THE WESTERN SEAS

Then they were off again to the westward, unconscious pioneers of all the wealth and commerce and beauty and science which has in later centuries made Barbados one of the richest gems of the tropic seas. By-and-by they slipped past the southern point of Grenada, and were within that fairy ring of islands on which Nature has concentrated all her beauty. Not more than five times before, perhaps, had those mysterious seas been ploughed by English keels; but there were those on board who knew them well, who had attempted, under Captain John Hawkins, to trade along those very coasts, and had, in true

British fashion, won their markets brave'y at the point of their swords. For the Rose, also, there was fighting to do. The first of it came when she touched at Margarita, the Isle of Pearls, then famous in all the cities of the Mediterranean and at the great German fairs. Lying in the roadstead was a Spanish man-of-war, as we would say, and three boats by her.

OUR HERO'S EXPEDITION WREST THEIR PRIZE FROM THE SPANIARDS

Now, it was a recognised law in those days that wherever British seamen found a Spaniard, they should fight him. So Amyas and his men went for the enemy, and in brave style. They scrambled up his sides, and the crew yielded at once, some falling on their knees, some leaping overboard; and the prize was taken. It was the first prize of the expedition, but it was a notable one, for ship and boats were full of goodly pearls which would bring a long figure in dear old England.

The men would gladly have hawked awhile round Margarita and Cubagua for another pearl prize. But Amyas, having, as he phrased it, "fleshed his dogs," was loth to hang about the islands any longer. Rose Salterne was ever in his mind, and he must now make straight for La Guayra. Soon they came within sight of the mighty range of the Caraccas Mountains, and one day more brought them to the port of La Guayra. Four thousand miles of sea had been crossed, and now they were at their destination.

AMYAS IS ON THE HEELS OF DON GUZMAN AT LAST

Just before reaching it, they had encountered an Indian in a boat, who warned them to avoid La Guayra altogether. "There are ships of war there waiting for you," said he; "and, moreover, the governor, Don Guzman, sailed to the eastward only yesterday to look for you!" Guzman? Ah, then he *was* really here! It was something to know so much. As for the ships of war, Amyas and his men would risk them. However, they found it a ticklish business. There, in the open roadstead, lay tossing at anchor five Spanish vessels, ugly-looking craft, at sight of which even the brave British hearts quailed. It was clearly impossible to surprise the town which held the governor's house while these ships were there. The leaders of the expedition looked at each other with anxious, inquiring faces. What was to be done? Were the plans and hopes of months to be brought to nought in an hour? A council of war was held, and behold, while they talked, the sun plunged into the sea, and all was dark. And with the dark came a decision.

It was Frank Leigh who made it. He had identified the governor's house, and he declared that he would himself go off in a boat, proceed to the house, and have audience of Rose Salterne, of whose presence there he had no doubt. Protests were, of course, made against his going alone, and they drew lots to fix his companion. The lot fell upon Amyas. So the two brothers went off with a small picked crew, well armed. Reaching the pebble beach, the men were left with the boat, and the brothers started for the governor's house, with their swords only. They reached the house all right.

HOW AMYAS TRIED TO SAVE HIS BROTHER'S LIFE AND NEARLY LOST HIS OWN

But what did they find there? They found twenty negroes lying around the terrace in front. At present, they were a sleeping guard, no doubt; but the slightest noise would waken them. One, in fact, wakened suddenly, and uttered a cry. Amyas dragged Frank down into the bushes, whispering: "Let us go back. We cannot go up without detection. Come back, for God's sake, ere all is lost." Just then, round the corner of the house a dark-cloaked figure stole gently, turning a look now and then upon the negroes, and came right towards them. It was Rose Salterne—no doubt about it. But what was that behind her? Another figure. Obviously it could not be Don Guzman, who was at sea. "It is Eustace, our cousin," exclaimed Amyas. "How came he here?" And Eustace it was. Eustace, remember, had been one of the rivals for Rose's hand, and he was, moreover, anxious to make her a convert to the Roman Catholic faith.

The brothers felt as if they should run their swords through him for this deception. They started up, and, in face of all danger, confronted the pair. Frank immediately made a wild appeal to Rose, who answered that she could

In Sir Richard Grenville's presence, Amyas Leigh listened to the "true and tragical tale of Mr. John Oxenham," as told by Salvation Yeo. Oxenham had sailed with Yeo and seventy men for adventure and treasure-hunting in the South Seas, but Yeo alone had returned to tell of their tragic fate. He had suffered many hardships, and had escaped from the clutches of the Spanish Inquisition. His story fired Amyas with a desire for adventure.
This picture is reproduced from the picture by Mr. Seymour Lucas, R.A., by permission of Mr. Mansergh.

face the chance of death, but not the loss of Don Guzman. At the same time, Eustace was shouting for help, and the negroes sprang to their feet. Amyas pulled his infatuated brother down the hill only just in time; for the whole gang of negroes was within ten yards of them, in full pursuit. Every now and then, the brothers turned to menace them with their bright blades; but once on the rocky path, stones began to fly fast. Twenty yards now, and the boat would be reached. But what was that?

The dull crash of a pebble against Frank's head. He sank on Amyas's arm. Amyas threw him over his shoulder, and plunged blindly on, himself struck again and again. "Fire, men! Give it the black villains!" he shouted to his crew. The arquebuses crackled from the boat in front. But there were dull thuds answering from behind. The governor's guard have turned out, and are firing at the hapless brothers, over the negroes' heads. If, as all say, there are moments which are hours, how many hours was Amyas Leigh in reaching that boat's bow?

Alas! the negroes are there as soon as he, and the guard are close behind them. Amyas is up to his knees in water—battered with stones, blinded with blood. The boat is swaying off and on against the steep pebble bank; he clutches at it—misses, falls headlong, rises half choked with water. Presently he is lying in the stern-sheets of the boat, and there is no Frank. So ended that fatal venture of mistaken chivalry.

It would take too long to tell of all the further adventures of the Rose and her men before Amyas returned home the third time. We should have to learn how he and his men slowly and painfully worked their way northward again; how they fraternised for a time with Indians whose chief food was ants and clay; how Amyas nearly lost his heart to a half wild, mysterious Indian girl; how the party crossed the Cordillera and captured a gold-train going down from Santa Fé towards the Magdalena; how they took a great Spanish galleon full of rich treasure; and how, at length, in the spring of 1587, they all found themselves once more among old scenes and old faces in the old homeland, with "treasure untold," as Amyas said to his

mother. They went out a hundred, and they came back forty-four. Where were the rest?

Their bones are scattered far and wide
By mount, and stream, and sea.

And what of Rose Salterne, she for whom this great adventure had been undertaken? Burnt, alas! at the stake as a heretic; for she declined to give up her Protestant faith. That was the way the Spaniard dealt with "heretics" in those bad old days of religious bitterness.

THE TRAGIC FATE OF ROSE SALTERNE AND FRANK LEIGH

The very morning after that terrible night's encounter at La Guayra, Rose was seized and taken down to the quay, and shipped off to Cartagena. She was asked to recant and become a Romanist, but she remained firm. Three weeks afterwards, she was brought out to her fate. And with her, in the ghastly procession, walked Frank Leigh, who had recovered from his wounds only to die by the fires of the Inquisition. These two, who had loved and lost, walked together now, and were burnt at one stake. "They were both very bold and steadfast," said an eye-witness, "and held each other's hand to the very last."

When Amyas Leigh heard all the dreadful story, he vowed another oath, and it was this: that he would kill Spaniards, in fair fight, by land and sea, wherever he met them. The day was close at hand when Amyas could fight the Spaniards at home. For this was the year of the great Armada—that same 1588 which decided, once and for all, the fortunes of the European nations, and of the continent of America.

AMYAS IS CHEERED AT THE PROSPECT OF ENGAGING DON GUZMAN AFTER ALL

We all know the story of the twelve days' fight which closed with the complete rout of that vast armament which Philip II. sent over to subdue us. All that concerns us about it here is the part played by our hero. Above and beyond his delight at fighting the Spaniards, he had the hope of encountering Don Guzman, his old rival. But it took him some time to find the St. Catherine, Don Guzman's ship, among all that array of craft. Day after day, in the protracted tussle, he sought for his prey. At last his quest was successful.

"Don Guzman!" he shouted, as he brought his own ship up against the Spaniard. "At your service, sir, whosoever you may be," was the reply. A dozen muskets and arrows are levelled at the Don, but Amyas frowns them down. "No man strikes him but I. Spare *him*, if you kill every other soul on board. Don Guzman! I am Captain Amyas Leigh; I proclaim you a traitor and a ravisher, and challenge you to single combat." "You are welcome to come on board me, sir," answered the Spaniard, "bringing with you this answer, that you lie in your throat." "Coward!" shouts Amyas. "Why that name of all others?" demands the Spaniard. "Because we call men cowards in England who leave their wives to be burnt alive by priests."

HOW THE SPANIARD MET HIS FATE, BUT ELUDED AMYAS AT THE LAST

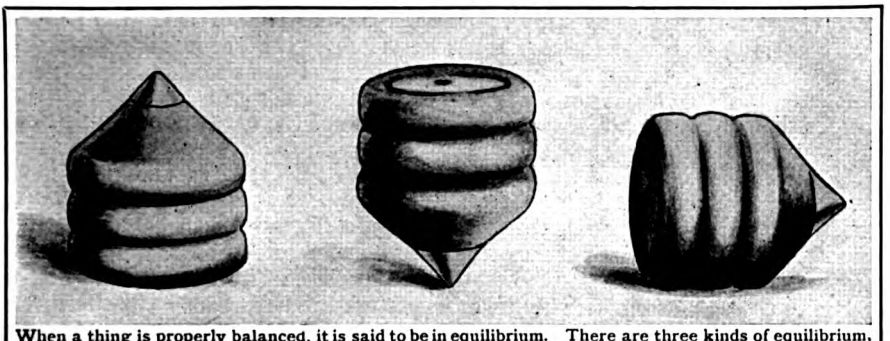
The Spaniard started, clutched his sword-hilt and tossed back: "For that word, you hang at my yard-arm if Saint Mary gives me grace." Then the fire began from both sides. Amyas poured in his shot till the Spaniard's sides were slit and spotted in a hundred places. But the Spaniard seemed invulnerable, and when night came she was still in a condition fit enough to rejoin her fellows. It seemed as if Amyas was to lose his prey after all. It would not be his fault if he did.

The Spaniards had gradually been losing ground, and in another day or two the "invincible" Armada, pommelled and riddled by the English, was seen in ignominious flight northward. Some part of the English fleet started after them, but had to give up for want of powder and shot. Amyas Leigh alone held on. He must have his revenge. Sixteen days passed, and still the chase went on. Then, just as Amyas was about to close with his enemy, a great storm arose, and the mighty St. Catherine, with 500 souls on board, plunged her yards into the foam, and vanished for ever, taking with her the man who had stolen the Rose of Bideford.

"Shame!" cried Amyas, hurling his sword far into the sea. "Shame! to lose my right, my right, when it was in my very grasp! Unmerciful!"

And that was the end of all Amyas Leigh's exciting adventures.

The next Famous Books are on page 3801.



When a thing is properly balanced, it is said to be in equilibrium. There are three kinds of equilibrium, as shown by these tops. That of the first is stable, because, if slightly tilted, the top returns to its original position; that of the second is unstable, because a slight push will send it over; and that of the third is neutral, because, if pushed, it moves, and then rests in a similar position in relation to the ground.

HOW THINGS ARE MEASURED

CONTINUED FROM 3552

ALL our ideas of motion are, as we can understand, relative—that is, something moves *compared* with something else. We cannot say in what direction, or at what speed anything is moving, or even that it is moving at all, except as compared with something else. If, however, we admit this, still it is possible that we may measure relative motion, and compare it with other relative motion.

It has often been declared that science is measurement, and though this is very far from being the whole truth, yet it is quite true that everywhere it is the business of science to measure, and that the value of our work will always largely depend upon whether or not we have measured correctly.

Now, in this important question of motion—which, as we have seen, comes into everything—there are, to begin with, two great kinds of measurement which we must employ. There is nothing difficult in understanding this, because we make a measurement of this kind when we say that a runner can run a hundred yards in ten seconds, or that it took us an hour to walk three miles. When we say things like this we are measuring *time* and *pace*. In every kind of motion that we can imagine, whether of a runner, or of a star, or of the electrical particles inside an atom, time and space are concerned. As we shall see, there is something else also concerned, and that is *mass*, but we must begin with time and space. First of all we must have some way of measuring time, and, though we are very familiar with this nowadays, the hard work of a great many fine brains had been put into the subject before our watches and clocks were made possible. We have already learnt the law of the pendulum, which gives us the basis for a clock when we so arrange that every time the pendulum swings it touches something and turns a wheel a certain distance.

We know also that there is a kind of clock in the pulse of our own bodies, and when we are in health the pulse beats almost as regularly as the pendulum. Some people have supposed that our idea of time begins with a faint sort of feeling in our own bodies, due to the beating of the heart and the pulse. But, of course, we want some bigger facts than these to base our idea of time upon, and the most convenient, apparently, are night and day. Though the periods of light and darkness are not constant, yet the twisting of the earth *is* constant. It is getting very slightly

slower in the course of ages, because, as we have learnt, the tides act as a brake upon it. But this is so slight that, for all our purposes, the length of the day is a perfectly fixed and constant thing. We divide this up into twenty-four parts, which we call hours, and these into minutes and seconds. The second, then, is the thing we reckon from, and a second is simply a sixtieth part of a sixtieth part of a twenty-fourth part of the time that the earth takes to spin completely round once.

A THING ABOUT WHICH THE WHOLE WORLD AGREES

It is one of the most fortunate of all possible things that the whole civilised world is agreed as to the second. We call it a unit, as if time could be cut up into little pieces, each of which is a *one*, or a *unit* of time. All over the world, then, the unit of time is the same. If anyone proposed that we should have a unit of time rather longer, or shorter, than a second in this country, or that the units should be different in all countries, everyone would be horrified. Once men are agreed upon anything, they can see plainly enough what a lot of unnecessary trouble it causes when they do not agree.

Now, it is a pity that our unit of time is about the only thing we *do* agree upon. Everyone who has begun to think about the subject at all knows that if only we had the sense to agree upon units of weight and space, endless trouble and labour would be saved. First, as to space. If we think of a solid box, we shall understand that it is possible to measure space in three directions, or, in the case of a flat thing like a sheet of paper, we can measure in two directions—though, of course, the third direction really comes in, for the paper has a certain thickness; or, if we can imagine a line that has no width, then there is only one direction in which to measure.

HOW A KING'S ARM BECAME A MEASURE FOR A NATION

But, whatever we are measuring, all we need is one, two, or three measurements of distance, and so we want a unit of length, or distance—something to correspond to the second, the unit of time. In this country, as we all know, our unit is the yard, which we divide up into three feet, each divided into twelve inches. The length of the yard is supposed to have been based upon the length of the arm of one of England's kings. There is really no particular reason why it should be as long as it is, for it is not based upon any natural distance, as the second is based upon a natural period of time, the time of the earth's rotation. Nor is there any reason why the yard should be divided up as it is, and there is still less reason why 1,760 yards should make a mile. To tell the truth, all the English measurements of distance, and the measurements of weight, which we borrowed from them, are needlessly complicated. They only make endless trouble, which does no good to anybody, and the time will certainly come when they will be all swept away.

The point is this. Because we have ten fingers we count in tens; therefore, for ease and quickness of reckoning, all our measurements should be in tens; then, in order to reckon, we should only have to use the very simple method which we learn when we study decimals.

THE MEASURE THAT IS USED ALL OVER THE WORLD

All over the civilised world now, men of science have agreed upon a certain kind of measurement which is not the English measurement at all; and in most countries the scientific way of measuring is also used for ordinary purposes too. Our merchants are often very seriously at a disadvantage, because they reckon in different terms from the rest of the world, and will not take the trouble to find out how the rest of the world reckons. If foreigners cannot count like us, they must be stupid, we think!

This new and sensible system of reckoning is called the metric system, from the word *metre*, meaning measure, which is its unit of length. We owe the metric system to the French. They wanted to get a natural basis of measurement, and so they measured the distance from the earth's Equator to the Pole, and took a fraction of that, and called it the metre. As a matter of fact, their reckoning was not quite accurate, but that does not matter.

The point is that all the other measurements are based upon the metre in tens. The length of the metre is slightly more than thirty-nine and a third of our inches, so it is rather more than three inches longer than a yard. Then, in order to get fractions of a metre, or

multiples of a metre, there are used, all over the world, terms derived from Latin. For instance, the tenth part of a metre is called a *decimetre*, the hundredth part is called a *centimetre*, and the thousandth part a *millimetre*.

THE WONDERFUL METRIC SYSTEM THAT MAKES RECKONING EASY

This, however, only begins to express the simplicity of the metric system. The great point about it is that all the other kinds of measurement are calculated from the metre. For instance, our pints and quarts have nothing to do with our yards. But in the metric system all the measurements of bulk are based upon the length of the metre, and then the measurement of weight, or rather of mass, is based upon the weight or mass of a certain bulk, the size of which is derived from the metre. The consequence is that weight, and volume, and length, can all be understood in terms of each other in a moment, and the labour of reckoning becomes practically nothing at all. Thus, if an American man of science were now compelled, instead of using the French method, to do all his reckoning in inches, and grains, and pints, and so on, he would get about as much work done in a week as he now does in a day.

A good many sensible people want us to adopt the metric system generally in America, just as it is already adopted for science everywhere; and most of the children who read this will probably live to see the change made.

Now we have the unit of time, which is the second, and the unit of length, which is the metre; but when anything moves there is another question besides time and space, and that is the amount of stuff that happens to be moving.

THE MUDDLED SYSTEM OF WEIGHTS AND MEASURES THAT WE USE IN AMERICA

In this country we reckon in grains, and ounces, and pounds. These have no relation whatever to yards, or to inches, or to pints. A certain number of grains and ounces make up one kind of pound, and other numbers make up another kind of pound, and everything is as muddled and stupid as it can be. So we can quite understand that men of science do not reckon in these ways. We want a unit of mass that is based on something, and, of course, we shall choose it in a simple, useful relation to our other measurements. This, then, is what we have done. We choose water because it is so familiar and important. Now, we know that water is at its densest, or most shrunken, when its temperature is four degrees above zero, or nothing, on what is called the centigrade scale. So we say that we shall use, as our unit of mass, the mass of one cubic centimetre of pure water at the temperature of 4°C. This unit of mass is known as a gramme. It is roughly equal to about fifteen of our grains. Just as in the case of the metre, we can divide the gramme into tens, and hundreds, and thousands, or multiply it in the same way.

The scale of temperature called centigrade—that is, "hundred steps"—is also based sensibly upon tens; *o* on this scale is the freezing-point of water, and 100 is the boiling-point of water. This scale is used by men of science all over the world, and for ordinary purposes, too, in many parts of the world. But in the United States we still stick to the Fahrenheit scale, though we have not even the excuse that it is an American invention. On this scale, the freezing-point of water is 32, and the boiling-point 212. This is all we need say about it here, since it is never used in science.

WHERE A POUND DOES NOT WEIGH A POUND

We have sometimes used the word weight and sometimes mass. Commonly, weight is sufficient for our purposes, because weight and mass practically come to the same thing; but in reality weight and mass are quite different, weight being a consequence of gravitation, while mass is really the actual amount of stuff in a thing.

If gravitation ceased there would be no more weight, but the mass of everything would be unchanged. A pound of lead contains a certain amount of lead, wherever it is; but it really weighs slightly more than a pound if you throw it into a ditch, and it weighs a trifle less than a pound if you hold it up in your hand, because weight depends upon gravity, and gravity depends upon its distance from the centre of the earth. On the moon the lead would weigh far less, on Jupiter far more, and on the sun still more, but the mass of the lead would remain exactly the same all the time.

Now that we have our units of time and space and mass, we can begin to

put them together, and then they become very interesting. When we reckon time and space together, plainly we get the idea of speed—how much time was occupied in covering certain distances. In science it is common to take together the idea of speed and the idea of direction, and the word that is used is *velocity*.

Velocity means more than speed, for when in science we say that a thing has the same velocity, we mean not only that it is moving at the same speed, but also that it is moving in the same direction. Here, however, we need only think of speed, and need not trouble ourselves about velocity. Sometimes in Nature we find that speeds regularly increase, or regularly diminish. This happens, for instance, when a body falls under the influence of gravity, or when it is thrown up, and is slowed down, by the influence of gravity.

WHY IT IS DANGEROUS TO FALL FROM A GREAT HEIGHT

It has been proved that whenever anything falls to the earth under the influence of gravity, in each second of time it passes through thirty-two more feet of space than it did in the second before. This, of course, explains to us why it is more serious to fall from a great distance than from a small distance. If gravity simply pulled a body at a certain rate which did not change, it would hurt us no more to jump from a high tower than to jump off a chair. But what happens is that the speed of a falling body constantly increases, so that the farther we fall, the greater the force with which we strike the ground.

Of course, when we state this about the speed of motion under gravity, we assume that nothing interferes with the action of gravity. But we know that gravity is not the only force in the world. For instance, let us take the case of a raindrop. Suppose that a raindrop formed in the sky had to drop through empty space to the earth. In the first second it would cover not 32 feet, but 16, because, at starting, its speed would be nothing, and only at the end of the first second would the speed be 32 feet per second. So the distance covered in that first second would be one-half of 32 feet; in the second it would cover 48, and so on. If we knew the height from which it began to fall, we should know its speed when it reached the earth. If, also, we knew its mass, we should know the force it had in it at the end of its journey. But, in point of fact, a drop falls through the ocean of air, which is resisting it all the way, and which, fortunately for us, greatly diminishes its speed.

HOW THE AIR PREVENTS THE FALLING RAINDROPS FROM KILLING US

Were it not for this resistance, we do not know what would be the consequences of being struck by a raindrop or a hailstone. Recent work has shown that there is a limited speed which raindrops cannot exceed, because the faster they move the greater is the resistance of the air; and so at last they cease to move any faster. This, of course, would not be the case if gravity were acting without anything to interfere with it. People who study the speed of ships in water know that the same thing applies there, and that the faster the ship moves, the greater is the resistance of the water.

Gravity, as we have said, is not the only force in the world, but it is always acting everywhere upon everything. If, then, we find things at rest, there must be some other forces which are working to oppose the force of gravity. When we think of this, we shall see that we get a new idea of what we mean by rest.

Undoubtedly there is really no such thing as rest. Everything is continually moving, and it is moving under the influence of forces, such as the force of gravity—the table at rest on the floor is moving with the floor and the earth. But still that table is at rest as compared with the earth—relatively to the earth, as we say. And so, while understanding that there is only relative rest, and no real rest anywhere, we must ask ourselves what rest means, and upon what it depends.

THE FORCES THAT ARE NEEDED TO KEEP A THING AT REST

It might be thought that when we are studying motion, rest has nothing to do with our subject, because we think of rest as the opposite of motion. Yet that is not true. What we are really studying, whether we are looking at motion, or at rest, is the action of forces. Newton's first law of motion might just as well be called the first law of rest. It applies equally to both states. Whether moving, or at rest, a body is subject to

forces. If these forces are perfectly balanced in strength and direction, then it will remain at rest; if the balance is in the slightest degree imperfect, then it will move. Therefore rest, just as much as motion, is a question of forces.

This will help us to understand a new word—*equilibrium*. The word suggests the word equal; and when we study equilibrium, we are studying the condition of a body which is under the influence of equal and oppositely acting forces, and is therefore at rest. This is not an easy subject, but the elements of it are not difficult. We can easily find instances in everyday life which show that bodies at rest are not all in just the same kind of state; in other words, there are different kinds of equilibrium. This question is important not only from the point of view of the study of forces, but also because it deeply bears upon practice in the sailing of a boat or the flying of an aeroplane.

THE MANY WAYS IN WHICH A THING MAY BE AT REST

We say that a body is in a state of *stable*—which means stand-able—equilibrium when it resists attempts to disturb it, and if moved will actually return to its original position; that is, of course, if the force that moves it does not go on acting. A tumbler standing in a cupboard is in a state of stable equilibrium. If we attempt to tilt it, it will allow itself to be moved a considerable distance, and will yet return when we remove the finger; or, if we hang a weight from the end of a piece of string, we have a true case of stable equilibrium, no less than in the case of the tumbler, even though the least touch will set the thing swinging. The point is that the weight will always tend to return to its original position.

But an egg balanced on end is in *unstable* equilibrium, because, though it may be balanced for the fraction of a second, it cannot recover from the tiniest amount of disturbance. That is the mark of unstable equilibrium—that the very least possible disturbance, in any direction and however brief, is sufficient to destroy it.

There is another kind of equilibrium, neither stable nor unstable, which is called *neutral*. meaning that it is neither the one nor the other. A billiard-ball at rest on a table is the best instance of neutral equilibrium. It is at rest; that is to say, the forces acting upon it are perfectly balanced. If now it be disturbed by a gentle push, it will move a little way and then come to rest again.

That is the proof that it is not in a state of stable equilibrium, because it shows no tendency to come back to its original position, unlike the weight hanging from the string. But yet it is not in a state of unstable equilibrium, because it does not continue to go on indefinitely leaving its original position, but does soon come to rest.

THE IMPORTANT LAWS OF MOTION THAT THE SEE-SAW TEACHES US

The study of rest very soon becomes highly complicated. For instance, let us take the case of a see-saw. It is possible for the see-saw to be at rest with a little boy at one end and a big boy, not at the other end, but half-way along towards the other end. The heavy weight on one side balances the lighter weight on the other side because the power of the two forces depends upon their distance from the point where the see-saw is supported; and these two downward acting forces—for the earth, of course, is doing its best to pull both the boys straight downwards—are exactly balanced by an upward force acting through the support of the see-saw. When we come to study the weights of the two boys and their distances from the centre of the see-saw, we find the one condition on which the see-saw can be balanced. This is one of the most important facts that we have to learn in this part of our subject.

THE DIFFERENT KINDS OF LEVERS THAT WE USE EVERY DAY

The see-saw will be balanced only when the weight of the one boy, multiplied by his distance from the centre of the see-saw, is exactly equal to the weight of the other boy, multiplied by his distance from the centre of the see-saw. This discovery explains to us the working of the various kinds of levers. When we look at the see-saw, we can see that the little boy at the end of the long arm, able to lift up the big boy on the other side, is acting like a lever. He is, indeed, acting just as a crowbar acts. The man working with a crowbar exerts a comparatively small force at his end of it, but does a great deal of work at the other end of it.

We can only understand how this happens if we think of the crowbar as a kind of see-saw, with a long arm where the man applies his force, and a very short arm on the other side. The same applies to pincers, which have long arms and short arms, as we know, and to nut-crackers, and to a man rowing a boat, and to a host of other things.

We can readily understand that often a moving object or a still one may be acted upon by two or more forces which are not perfectly balanced in opposition to each other. If they were, the moving object would be brought to rest, and the resting object would remain at rest. But if the forces do not exactly balance one another, then the thing which is being acted upon must move. But how will it move; in what direction, and at what rate? Can we possibly predict the course that the body will follow if two or more forces of different strengths are pulling upon it in different directions? The answer is that though this is a very difficult matter, yet the laws of motion are equal to the study of it. Each force has its own value, both as regards its power and its direction, no matter whether there be one other force acting or a million; and if we know the power and the direction of all the forces that are acting, we can say in what direction the body will move and at what speed. In other words, to use the special language of this subject, we can predict its velocity.

The tendency of a moving body is to go on in a straight line, and if the stone in this diagram were loose when it reached B or D it would travel towards C or E. But the string pulls the stone towards A, and this force modifies the other, so that the stone goes in a circle. The stone's tendency to fly in a straight line is called centrifugal, or centre-fleeing force, and the force pulling it towards the centre is centripetal, or centre-seeking force.

How a Planet's Motion Teaches Men the Laws of the Universe

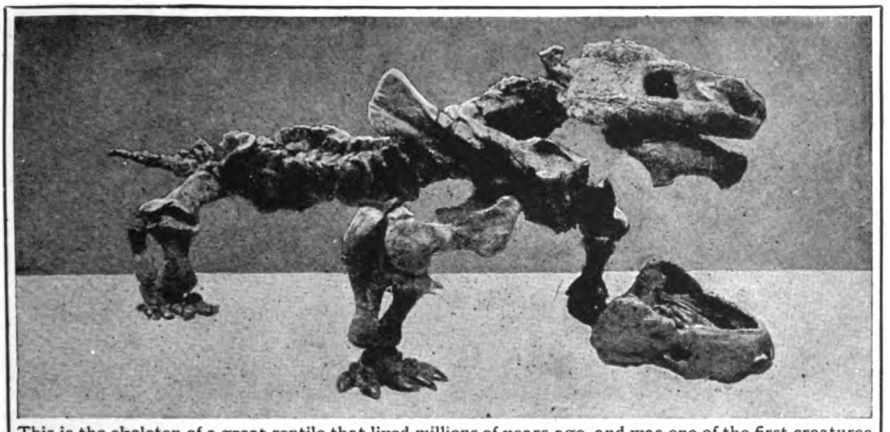
This is enormously interesting looked at from that side, but it is still more important when we take the case of a thing which is actually moving—say, a planet—and moving in a certain direction at a certain speed. For, by the application of what we know about forces, we can discover what are the forces acting upon the planet, the net result of the whole of which, acting together, is that it moves as it does. The first law of motion says that a moving thing tends to move in a straight line. Put a stone in a sling and swing it round your head. The stone does not move in a straight line, but in a sort of circle. But cut the sling, or let it go, and the stone flies out. Or take a planet swinging round the sun. The first law of motion says that its tendency is to move in a straight line, but in point of fact it moves in a closed path round the sun like the stone in the sling.

Why the Planets do not Fly off into Space

In both cases the explanation is that there is all the time a pulling force acting and preventing the stone or the planet from flying off. Certain words are very commonly used to describe this tendency of the stone to fly out, and the tendency of the hand and the sling to hold it in a closed path. These words, which mean centre-fleeing and centre-seeking, are not useful. They date from a time when the laws of motion were not understood. The useful thing is to know what happens when a body, moving in a circular path under the action of two forces, first, the force of its own motion, and, second, the pulling force from the centre, is allowed to go its own way. The answer is that, when this occurs, it flies out at a tangent to the circle. On this page is a picture which shows a circle and two tangents to it, and if we suppose that the sling is opened when the stone is just at the point where the tangent BC or DE starts from, then the stone will fly out at that tangent.

It is nonsense to call the force which sends the stone flying out a centrifugal force. The stone is not trying to fly from the centre. If it is allowed to move on its own account, it will move in a straight line.

The next part of this is on page 3813.



This is the skeleton of a great reptile that lived millions of years ago, and was one of the first creatures to live entirely upon land. It was found at Cape Colony, but similar remains have been dug up in Russia.

NATURE'S GREAT FAMILY

CONTINUED FROM 3416

We come at last to the end of our stories of the animal world. None of us are foolish enough to suppose that we have studied all the living creatures of the world. To write of them we should have to make many books. It would be impossible, at this stage of our study, to view the whole field of Nature. Nobody knows *all* about the living things of the world. The farther we go, the more we realise how very little we really do know. Great men find the study of animal life so difficult, that they are content with a knowledge of things in general, and are happy if they can call themselves expert in some particular branch. That is the only way in which we can get knowledge—to have men who will devote their lives to study and research, each in his own particular branch.

What we have been doing is to take peeps at scenes scattered far and wide over the world, and we have seen the creatures in them—some great and fierce, some merely huge; others of great service to man, others among his enemies; others, again, among the things which help to gladden the world with beauty and with melody.

We have only peeped. Nowhere has there been time for us to go into the heart of a subject, and make ourselves completely masters of it. Let it be hoped that what we have seen and learned has made us all the more anxious to search deeper into the mysteries and beauties of Nature. We can all be naturalists if we will. The country boy has a world of animals ready for him to study, if he will but look about him. The child born and reared in the town, if he will but go into a garden, may find on every hand material for the happiest, healthiest study.

But with what impression does our study of the animal world leave us? What are we to think of Nature's great family, of which we ourselves are but a part? We see that we ourselves *are* truly part of the great family, and it makes us ponder deeply.

We have seen how wonderfully some of the animals resemble us. We have seen that the man-like apes are shaped as we are shaped, except for a difference between our hands and feet and theirs. We are not to believe that we are descended from monkeys, because that is not true. That never has been seriously put forward by men who understood the question. We are taught by our greatest thinkers to believe that we descended, or, rather, *ascended*, from creatures from which the monkeys also descended. Far,

far back in time, there existed creatures whose descendants became on the one side men and women, on the other side monkeys.

The Bible story is true, but the Bible does not teach science, and it must be read intelligently in the full light of truth as we know it. When we read that God made the world in six days, we must remember that the word "day" is only man's word. Moses—who wrote one of the Psalms—sang: "A thousand years in Thy sight, O God, are but as yesterday." What we call days, the days in which the world was made, may have been ages too long for the human mind to understand. Man would pass through very many stages before God made him perfect.

All life came from the sea, and the creatures from which God ordained that man should spring shared the common lot of all other creatures. It seems hard to believe that men and women could have descended from a form of animal life which gave us apes and monkeys; but that is not harder to believe than that the lemur and the great gorilla descended from the same parents. Yet such is really the case.

THE SOUL, THAT MAKES MAN THE LORD OF ALL CREATION

The lemurs were the first of all the monkey tribe. The lemurs are our very distant cousins, and so are the powerful gorillas. The chief difference is that God gave man a soul; He ordained that man, in his final form, should be the lord of creation. Animals have not souls. That, at any rate, is what men believe, though, when we see a bad man and a faithful dog, we feel it a shame that the brutal man should have a soul, and that the animal should not.

There is a wide gap between the lowest forms of human life and the highest forms of animal life, but there is a wide gap also between the highest and lowest forms of human life. Let us think of one of our great scientists, say, of Pasteur, whose studies of animal organisms resulted in the saving of thousands of human lives; or of a great musician or painter, whose melodies and pictures uplift the hearts and minds of men and women in every civilised land; then let us think of a band of cannibals, and let us ask ourselves: Can these great and noble men really belong to the same race as these horrible creatures? Let us think of Ruskin, and the influence he has had upon the English-speaking people; then of the degraded men among whom Livingstone lived, and worked, and died.

THE LOWER MEN, WITH LESS LOVE THAN THE HIGHER ANIMALS

They killed and ate one another with as little fuss as we should pluck and eat an apple. If one of them wanted to tie the tail of a gaudy parrot in his hair, the customs of his tribe compelled him first to murder a woman; if he wanted to wear the skin of a certain animal, he must first murder two or three of the people about him.

The natives of Tierra del Fuego, whom Darwin described, were superior to the animals, for they could light a fire and use tools; but they had not as much love for their families as the apes have for theirs. One of the men was seen to dash a child down upon the rocks and kill it, because it had happened to slip, and let fall some sea-birds' eggs. Even a gorilla loves its little one, and will defend and tenderly rear it. But these savages, when winter came, and food was scarce, used to take their old women and kill and eat them. Yet once upon a time these people had been far higher in the scale of human civilisation.

They had wandered down from the mainland of South America, where human society was well advanced. It is worth while to study an instance of this sort, for it shows us another side of the picture at which we have been accustomed to look. We have been in the habit of seeing how man and animals have progressed; but this case enables us to see how, in certain circumstances, man can degenerate. Miserable and evil as they were, these savages were the same in form and soul as the rest of us who are living in happier lands.

HOW NATURE IS EVER IMPROVING HER CHILDREN

Nature is the wisest of mothers. Everything in her home—which is the world—moves in due order, without hurry, without error. First, there were created the simplest forms of life, plants, and jelly-like things in the sea, and tiny things which we call infusoria. The infusoria have not changed. We know all about them from reading their life-story on page 2335. They are the

same in form and character to-day as they were at the beginning of time. All through the ages they have been a constant food supply to multitudes of animals which have developed and become more important in the world. Things which started from the same place in Nature, from the same elements as the infusoria, developed in slow process of time into monstrous animals; but the tiny infusoria retained their first form.

A single infusorian, of itself, is of no account, but after a week of life it will have become the parent of a hundred billion infusoria. And every infusorian of that tremendous total—200 pounds in weight—is of importance to us, not only because it may serve as food for animals, but because, with other still smaller organisms known as bacteria, it eats decaying substances. So that the tiny infusoria are of more importance to the world than the lordly elephant or the majestic lion.

A FULL-GROWN GORILLA

From the same elements which formed the infusoria and other tiny things, there gradually grew up the true jellyfish, the lovely sea anemones, the wondrous corals, and the things in the sea that sting. Already Nature had begun to arm her children, we see, by giving them stings. Next came worms, leading on, in one line, to other worms. Along another line there developed the sea urchins and sea cucumbers, the starfishes and the brittle-stars and feather-stars. While these were growing up along one line, in another line the crustaceans began to develop; and at the head of their line came the insects, appearing in the world at the same time that, along the other line, gasteropods, things like whelks, and so forth, came into being, followed by the cuttlefishes. Little by little, new forms of life were thus appearing in the sea, and there were, so far, no living animals on the land. Then came two important changes. On one hand came the lancelets, and on the other the tunicates.

They grew out of a lower form of sea life, and seemed likely to become a good deal higher, but they did not quite manage it. The lancelets remain to-day just where they were millions of years ago, when they first assumed their new form. They almost became true fishes, but they stopped just short. The lancelet remains still a small, almost transparent "fish," living at the bottom of the deep sea or mouths of deep rivers, and has got no further in life's progress. There must have been many forms like it when the upward move first began, but the lancelet settled its form after a struggle, and has never departed from it. The members of the family which improved themselves passed up higher, stage by stage, in their family history, and perhaps to-day we might find among the hummingbirds and the ostriches descendants of what, far, far back in the ages, were once things very much like lancelets. The tunicates, after having progressed a long way from the life-forms below them, stopped short. They were meant to go higher, along with the creatures that set out with themselves in the race of progress. The tunicates, from age to age, have been promising, as it were, to become something higher. They were near to becoming the first backboned animals, but they have always failed to fulfil their promise. The young ones seem decidedly to rank with the backboned animals, but when they grow up they fall away like the rest, and show no more backbone than a jellyfish. These two forms of animal life remain to-day as they were millions of years ago, to show us in life what we should

have otherwise to seek in fossil form, the character and nature of the things out of which the higher forms came. For, from the lancelet stage there grew up the real fishes. We see what the first types were like, because the tunicates, the lancelets, the hag-fishes and lampreys, which are not fish at all, are with us to-day, to tell the story of life unchanged. True, they live in the waters of the sea, but they have no jaws, no limbs, and no scales.

THE FIRST CREATURES TO HAVE BACKBONES AND JAWS

The fishes marked a very important upward stage. They were the first of all animals to develop backbones and proper jaws, that gave them a great advantage over other forms of life, and caused fish to take different characters. Fish took to eating fish. Those fish which had the stoutest armour of tough scales would have the best chance of escaping their enemies, and of getting less protected fish to eat. For a long time the bony fishes, the ganoids, as we call them, flourished exceedingly, with their powerful framework of bone and their heavy armour.

The other fish, the fishes whose framework is mainly composed of cartilage, must have had a bad time of it for a long time with these bony-armoured monsters. But there we get the first lesson in the history of the animal family of the uselessness, in the long run, of special protections of this sort.

Sheer weight and strength of armour never, in the long run, carry any class of animal life to success. In the case of the fishes, it was those with the softer skeletons that triumphed. Of all the multitude of bony fishes that once peopled the seas, only seven different kinds remain alive to-day, while those less specially protected abound in countless varieties. Let us keep this fact in mind for a few moments, to remember it when we come to the higher animals.

HOW ANIMALS GREW LUNGS AND LEARNED TO BREATHE

The next stage was for the animals to learn to breathe the air of the atmosphere—a most tremendous stride. They had to develop lungs as well as gills. Gills enabled them to breathe by taking oxygen out of the water that coursed over their gills; their lungs enabled them to poke their noses above the water, and to drink deep of the air that, later on, man himself was to breathe. Man himself, in his early form, was a creature who had gills, to breathe in the water as the fishes breathe. The mud fishes, of which we read on page 210, are still with us, to show how fishes that have gills may also breathe by the aid of lungs, as human beings breathe.

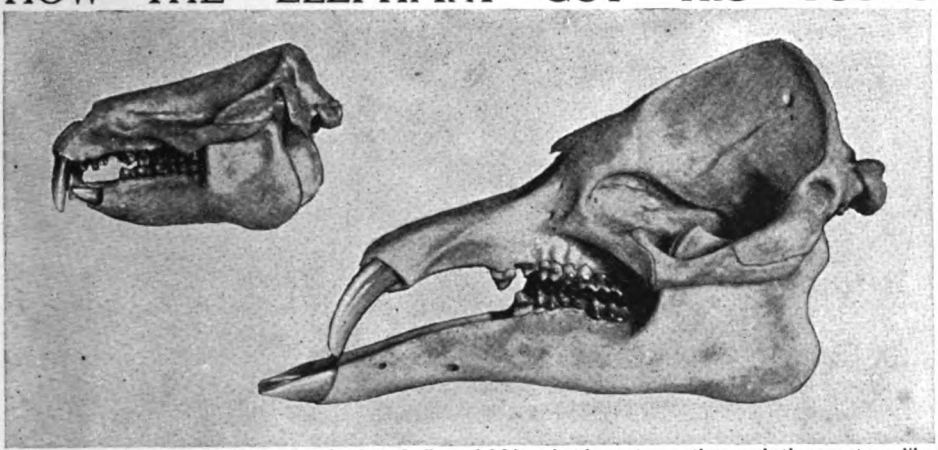
While the fishes were mastering these two sorts of breathing, there grew up, from the tunicate side of the family tree, the first amphibians, the creatures which begin their lives in the water, and end by coming to land. Newts and frogs must have been among the first creatures in all the world that ever set foot on dry land. Of course, newts and frogs did not soon reach the form in which we see them to-day. When we read, as on page 1223, of the various stages through which the frogs and newts pass from their baby days to their grown-up days, we see just the stages which they passed through during ages and ages. They now run through all these changes in the course of a few weeks, but in olden days each stage would last while thousands of generations of frogs and newts lived and died.

THE DAYS WHEN THERE WERE GIANTS ON THE EARTH

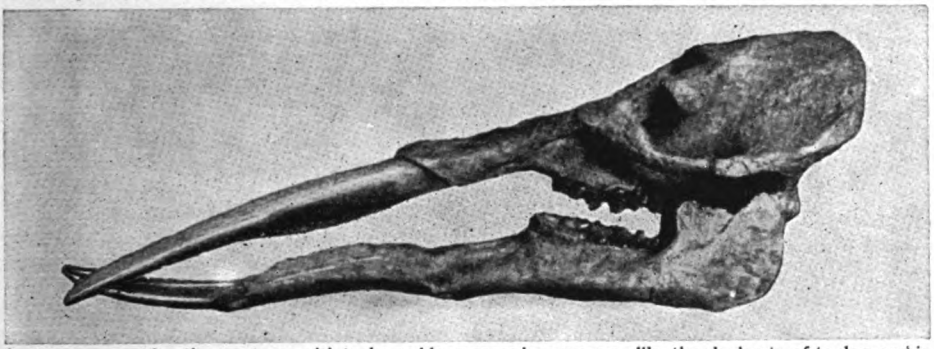
Then, when the fishes began to breathe the upper air, and amphibians began to disport themselves on land, the animal family underwent great changes. The world came to the age of reptiles. Snakes were created from the lower creatures, and with them appeared the crocodiles and tortoises, and those fearful monsters of which details and pictures are given on page 44. That was indeed an age of giants. We have not time to go again into their history; we may very well turn to page 46 and the pages which follow, and refresh our memories with the stories there set out; and the pictures will help us to fix in our minds the figures of some of the fearful and wonderful creatures which, in those days, became masters of the world before ever man had been created.

We are bound to notice how the way was prepared for these monsters. Insects by this time abounded, and they had taken to leaving the water, in order to escape from the giants which fed upon them in the seas and rivers. The

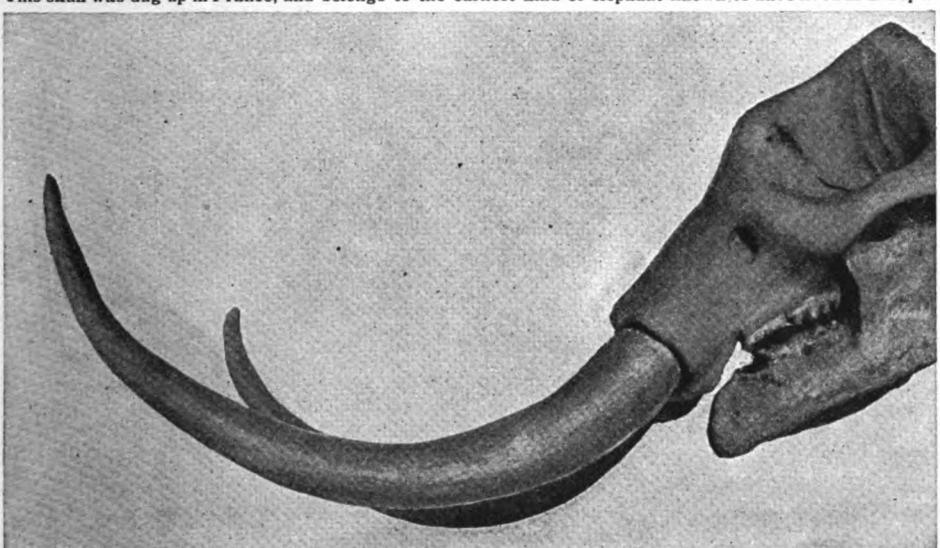
HOW THE ELEPHANT GOT HIS TUSKS



At the present time elephants are found only in India and Africa; but in past ages they, and other creatures like them, roamed all over the northern hemisphere, even in the Arctic regions. Here are the skulls of two ancestors of the elephant, the moeritherium on the left and the palæomastodon on the right. They were dug up in Egypt.



As the ages went by, the creatures with tusks and long noses became more like the elephants of to-day, and in this picture we see the skull of the tetrabelodon, a more recent animal than those whose skulls are shown above. This skull was dug up in France, and belongs to the earliest kind of elephant known to have lived in Europe.



This skull was found in America, and belonged to the mastodon, a kind of giant elephant, that roamed over Europe and North and South America a million years ago. These skulls, which are in the Natural History Museum in London, show how the elephant's tusks have come by gradual lengthening of the great cutting teeth.

insects, in those early days, grew and developed like all other things, and some of them were as big as chickens. They fled to the land, and the animals followed them, some of them to catch the insects, some of them to eat the plants which by this time flourished on the earth; some again to eat the creatures which fed on plants or insects.

How creatures learned to fly and leap and climb

We may very well believe that the desire of the insects to get away from their enemies first drove them to land, and then gradually led them to form habits of flying. The reptiles which fed most on insects would now find it more difficult to catch them. The reptiles would climb about the trees after the insects, and, like the flying phalangers, and other so-called flying animals of to-day, would learn to take leaps from tree to tree, and from branches to the ground.

And they must have gone on doing that for ages and ages, before the first real bird came into being. The first bird was a curious animal, with a great beak which had teeth in it, with a tail fleshy, and long, and jointed like a lizard's, and with feathers growing out from the joints. It must have been a horrible-looking thing, with its lizard-like body and frightful toothed beak. But that nightmare creature was the father of all the birds that now inhabit the earth, and it was evolved from reptiles which had fishes for ancestors.

While the birds were growing into shape, a very important development was taking place in another direction. The mammals made their appearance. The mammals, we remember, are all the creatures which feed their young ones on milk. Elephant and squirrel, whale and mouse, seal and cow, wolf and walrus, lion and llama—these, and the rest like them, are mammals. The class began in the strangest animals, of which the echidna and ornithorhynchus, or duck-bill platypus, are still living with us, to tell us the romantic story.

The animals that laid eggs and put them in their pockets

The animals branched off from the reptiles where the birds began, and it must at one time have seemed a chance whether they would be four-footed animals or birds. They laid eggs, but fed their young ones on milk. Some carried their eggs in pouches, as the echidna carries hers, and as the kangaroos and other pouched animals carry their young ones to-day. They were the first of the mammals, and it makes us hold our breath to think that we may still see representatives of these earliest mammals alive to-day, unaltered from the kind which first gained permanent shape, millions of years ago. From this great change in the animal family all other mammals, whether flesh-eating, insect-eating, or herb-eating, came into being.

After the monotremes—that is the name of the first mammals of which we have been talking—came the marsupials, the kangaroo-like animals. Next came the edentates, animals with no teeth, or very inferior teeth, among which was the gigantic megatherium, whose family is represented to-day by the sloths, the ant-eaters, the armadillos, the aardvarks, and so forth. With these there came into the world the sirenia, which sailors to-day call mermaids, and after these the great whales that live in the sea.

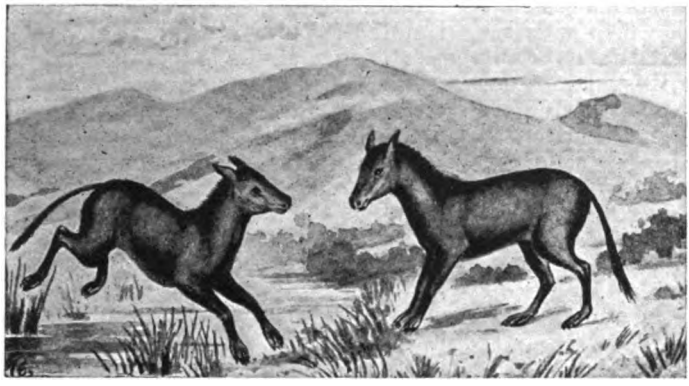
The great and fierce beasts that once roamed in England

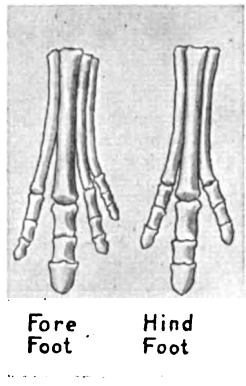
The insect-eating animals seem to have been followed by the rodents—the animals that gnaw. Then came the lemurs and bats, followed by the great flesh-eating mammals and the ungulates. The latter class give the world some of the most, indeed its *most*, important animals. The ungulates are the hoofed mammals. They include the pig, the peccary, the hippopotamus, the camel, the cattle, the deer, the sheep, the tapir, the rhinoceros, the horse, and the elephant. Of course, they were not like the creatures that we know to-day.

The mammoth and the mastodon were alive when man first appeared on the earth—the mammoth was living in America when the first men appeared here. The first horse was a little five-toed creature, which needed its many-toed, outspread feet for the marshy country where it lived, just as much as the camel needs its broad, expansive foot for making its way over the yielding sand of the desert. The monkeys came last, and after these the highest of all God's great family—man.

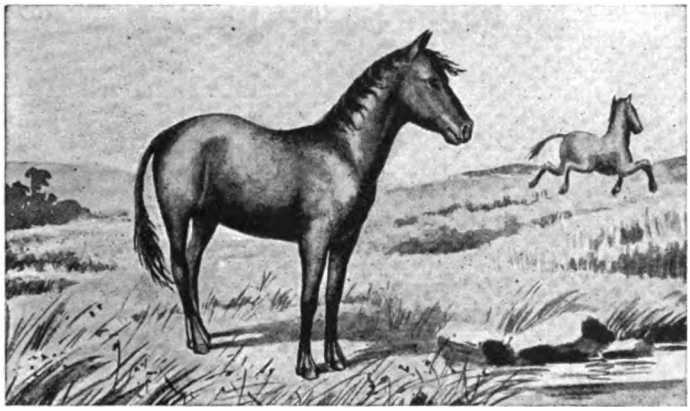
It will be as well to turn back at this point to page 608, and read again the wonderful story of the lemur, which was

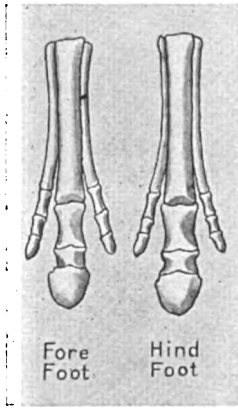
HOW THE HORSE BECAME STRONG & SWIFT



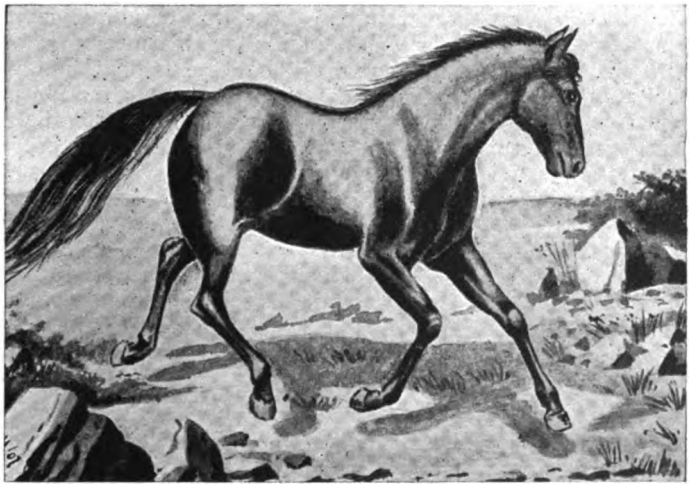


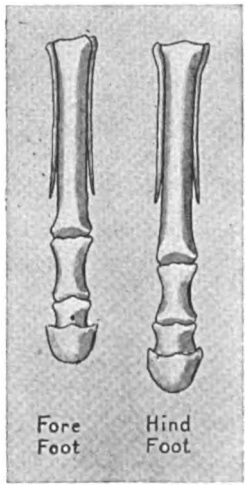
Hundreds of thousands of years ago, there lived some little animals like the creatures shown in this picture. They were about the size of a fox, and had feet something like a hare. They were not very strong, and soon learnt that, when enemies were about, the best thing to do was to run away as fast as possible.





As the centuries went by, these little animals changed. Each generation was a little stronger and larger than its parents had been, and after thousands of years the creatures became like those seen in this picture. The constant running away from danger had made its legs get longer, and its feet became like hoofs, as we see by the bones here.





At last, when still more thousands of years had passed, the little creature that was once only as big as a fox and had feet like a hare had changed completely, until it had developed into the noble and swift horse. All the toes but one had disappeared, or nearly disappeared, and the one that remained had become a thick and strong hoof.

the father of all the apes and monkeys. It is believed that the first of man's family sprang from the stock which gave the world the lemur. We need not go deeply into the question here, it is a matter for later study; but we must not pass away from it without a word in closing our story. The first men were high-shouldered, short-necked, long-armed, with slightly bowed legs, hairy, and with big teeth and yellow skin. They were wild and savage as the beasts of the field.

These are deep waters for young people to swim in, and we need not venture farther from the shore. We do not *know* all these things about the origin of man; we only believe these to be the facts. The real story can never be fully told, until the great day when all secrets are made known to man. We infer these things from similar evidences to those which help us to find out the story of the rest of creation. We do not know how long man has lived on the earth; some say 100,000,000 years, some say 20,000,000 years, some say only 50,000 years.

MEN WHO WERE CIVILISED TWENTY THOUSAND YEARS AGO

We know that man has lived very much longer on the earth than the old teachers believed. We may still find printed books giving the date of the beginning of the world as only a little over 4,000 years before the birth of Jesus. Yet as recently as the year 1909 men found, in a city long buried, traces of a high civilisation, and a great population, that existed 20,000 years ago.

It is certain that of all the great advances made in the animal world, the advance made by man is the most marvellous of all. Every page in this book tells of the marvels that he has done. The natural thing to believe and hope is that man will continue to improve in the future as he has improved in the past, when, in obedience to the will of his Creator, he emerged from the sea, and, by gradual stages, followed the path set before him, to become the wonderful creature he is to-day.

And so we end as we began, by trying to realise that every form of life in the world is related. We are such stuff as birds, and animals, and reptiles, and trees, and flowers are made of. There are the same elements in the worm as in the rose, in the child as in the tiger. But the mind of a child is something greater than anything the tiger has. It is not the thickness of armour nor the power of weapons that count for all time in the great battle of life.

MAN, WHO IS THE MASTER BECAUSE HE USES HIS BRAIN

Man is the weakest, so far as mere strength is concerned, of all the great animals of the earth. An ox could crush him; he would serve only for a single meal to a hungry tiger. But, though he is of the same substance as that of which they are made, he is their master. He has hands to use, and a brain to direct them. He makes tools that are almost as wonderful as his hands that create them. He has always had to use his brain for his living.

The giant reptiles and giant flesh-eating animals did not use their brains as man used his. They developed enormous bodies and amazing armour, but they did not develop their brains. Fearful weapons armed the sabre-toothed tiger, but the tiger that used its brains more and its sabre-teeth less survives to this day, while its more powerful ancestor is numbered with the fossils.

The mighty glyptodon, with its shell like a hut of horn, is part of the solid rock, while the little tortoise still flourishes on a modest diet of lettuce, with a handful of clover flowers as a luxury. The pterodactyle, with its bat-like wings and with claws upon them for climbing, is as dead as the teeth which armed its jaws, but its fairy-like descendants, the humming-birds, sport like magic motion in the tropical forests. The bat flitters light and airy as ever, when the moon peeps out, though most of the companions of its earliest days on earth have died out.

THE MANY FORMS OF LIFE THAT ALL SPRANG FROM ONE SOURCE

The hideous ichthyosaurus is turned to stone, but the jolly dolphin sports as merrily in the waves as if his family were new to the delights of the great waters. When we see that all living things sprang, in the first place, from the same source, and that all owe their presence on the earth, or in the waters, to the one universal kind of life, we feel a certain awe in the presence of any form of life.

THE NEXT PART OF THIS BOOK IS CONTINUED ON PAGE 3731.

SOME INDIANS OF THE PAINTED DESERT

In another article, called "The Fairy-land of Arizona," we have told you of the strange lotus charm of the Painted Desert. Today we will tell you of the peoples of that strange land — "peoples whose origin is as uncertain and mysterious as the ancients thought the source of the Nile, peoples whose history is unknown" except through legends and traditional songs and mystic ceremonies handed down from father to son through long generations.

We travel into the desert region to visit this ancient race, whose terraced villages, built upon dry, desolate plateaus called mesas, are the same today as they have been for many hundreds of years. The centuries have made but little change in this wild land and its peoples; we find that "the worn trails to the mesa summit are the same; the glaring yellow sand is the same; the red and gray rocks are the same; the glaring, pitiless sun with its infernal scorching is the same." Above in the villages we find "the pot-bellied, naked children, the little active young men, the not unattractive young women, with their peculiar style of hair-dressing, the blear-eyed old men and women, the patient and stolid burros, the dim-eyed captive eagles, the quaint terraced houses with their peculiar ladders, grotesque chimneys, passage-ways and little steps are all practically the same as they have been for centuries."

THE STRANGE PEOPLE CALLED CLIFF DWELLERS

Long, long ago — so long that no man can remember — a race of strange people built houses among the cliffs of Arizona, New Mexico and Colorado. They are commonly known as the Cave and Cliff Dwellers, but no one knows who they were nor whence they came. Ruins of their cliff houses can be seen today, and in another part of our book we have given a picture of some of these ruins. It is from this strange, ancient race that the Hopi Indians of the Arizona Desert are descended. Although naturally peaceable they were forced to turn their homes into fortresses and so they chose to build upon rocky hills or mesas for purposes of protection. "With but one or two almost inaccessible trails reaching the heights, their homes were easily defendable. Their fields, gardens and hunting-grounds were in the valleys or far-away mountains, whither they could go in times of peace, but when attacked by foes, they fled up the trails, established elaborate methods of defence, and remained in their fortress homes until the danger was past. The very construction of the houses shows this. In none of the houses is there any doorway into the lowest story. One climbs up a ladder outside, drops through a hole in the roof, and descends the ladder inside. When attacked, the outer ladder could be drawn up."

The hot desert sun beats down upon us pitilessly as we toil up the steep trail that winds to the summit of one of the mesas. As we reach the head of the trail, the picturesque village of terraced houses stands before us. The terraces are built two or three stories high, each story being set back from the one below, thus giving a part of the roof of the lower story to be used as a courtyard or playground for the children.

You will be astonished to learn that the Hopi houses are owned and built by the women. Indeed the position of a Pueblo Indian woman is very high. She owns the house and receives her husband into her home. The children take their clan name from their mother and not their father; the "corn, melons, squash, and other vegetables belong to her when once deposited in her house

by her husband. She is, indeed, queen in her own home, and is on quite equal terms with her husband."

Yesterday it rained in the desert. Today we find a large pool of muddy water, or rather of liquid mud, in the middle of one of the courtyards; and in the filth a dozen naked "fat, bronze cupids" roll and splash and yell — utterly indifferent to the beating sun. As we appear they scatter, helter-skelter, like small shy animals, and presently we are aware that a dozen pairs of round brown eyes are staring at us from where the children have taken shelter.

THE CHILDREN OF THESE STRANGE PEOPLE

These brown youngsters are a very important factor in the Hopi community. When the cornfields at the foot of the mesa are ripe the younger boys and girls scare away the birds or other marauders from the precious harvest that has been wrung with so much labour from the sandy, sun-scorched soil. And when the harvest is ready to be gathered, the little children, as well as the women, aid the men in gathering the crops, in steaming the corn in a great oven dug in the ground, and in packing the ears in sacks and blankets on the backs of the little donkeys, called burros, to be carried to the corn rooms on the mesa above. "All the young boys, even the little tots who can scarcely walk, use the bow and arrow with dexterity." We bribe the children to come forth from their hiding places by showing some pennies, and then borrowing a small hard melon from one of the kindly, wrinkled Indian women, we begin a shooting match. The melon is thrown into the air and the children shoot their arrows at it to see how many they can stick in it before it reaches the ground. One small chap manages to get three arrows in the melon.

But the children are not the only interesting members of this race. The group of girls in their picturesque blanket robes with their shining black hair twisted wheel-like over each ear are a very pleasant sight to look upon. Every Pueblo Indian girl, as soon as she is of marriageable age, twists up her hair so over her ears to symbolise the blossom of the squash. When she marries she parts her hair and wears it in doubled up braids one on each side of her head to symbolise the fully developed squash fruit.

The Hopis are wonderfully hospitable and presently we are invited to climb up one of the ladders and to descend into the house. As we squat upon the floor, the Hopi housewife places a big basket of flat yellow cakes called piki before us and signifies that we are to help ourselves. We do and find that the little cakes are not half bad.

COOKING PIKI ON THE STONES

"It is fascinating in the extreme to see a woman make piki," says George Wharton James. "Dry corn-meal is mixed with colouring matter and water, and thus converted into a soft batter. A large, flat stone is so placed on stones that a fire can be kept continually burning underneath it. As soon as the slab is as hot as an iron must be to iron starched clothes it is greased with mutton tallow. Then with fingers dipped in the batter the woman dexterously and rapidly sweeps them over the surface of the hot stone. Almost as quickly as the batter touches, it is cooked; so to cover the whole stone and yet make even and smooth piki requires skill. It looks so easy that I have known many white women (and men) tempted into trying to make it. Once while attending the Snake Dance ceremonials at Mashonganavi, a young lady member of my party was sure she could perform the operation successfully. My Hopi friend, Kuchyeampsi, gladly gave place to the white lady, and laughingly looked at me as the latter dipped her fingers into the batter, swept them over the stone, gave a suppressed exclamation of pain, tried again, and then hastily rose with three fingers well blistered."

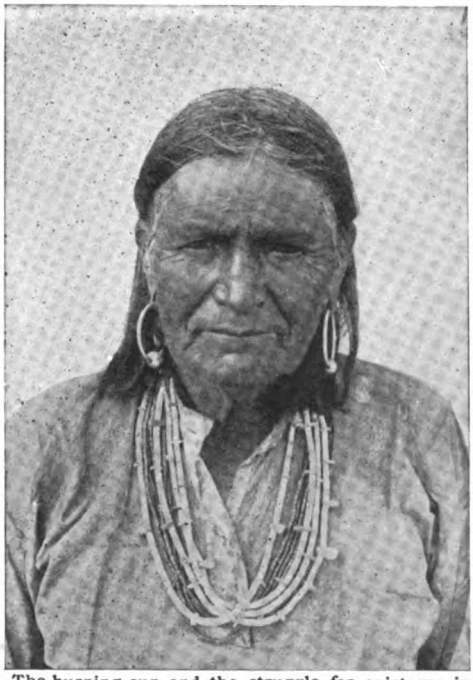
Although the Hopi woman, who has been grinding corn in a big trough while we have been eating the piki and has been talking to us by signs, is very interesting, yet we are glad to ascend the ladder and to get once more into the open air, for the ancient Hopi houses, though picturesque, are not the most wholesome places in the world.

INDIANS OF THE DESERT

We know that this is the picture of an unmarried Pueblo girl by the way in which she fixes her hair in two wheels over her ears to symbolise the squash blossom.

Here we see the young matron, who braids her hair in two rolled up loops to signify the ripe squash fruit. This symbolism of flower and fruit is very pretty.

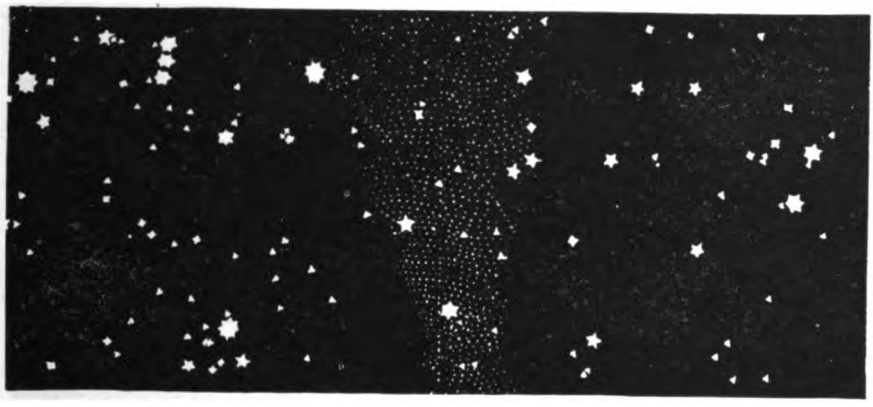
The Pueblo mother carries her papoose on her back. This picture gives a good idea of the blanket robe of the Hopi woman, which folds over one shoulder, leaving the other bare.



The burning sun and the struggle for existence in the desert make its inhabitants grow old very early. Here is the picture of a Hopi man in middle life.

THE PEAKS OF THE CANADIAN ROCKIES

Here is a striking scene in the Canadian Rockies, showing in the foreground the thickly wooded slopes of the hills below the timber line, and the snow-capped mountain peaks in the distance. Far away upon one of the peaks is a glacier, similar to those famous glaciers of the Swiss Alps. In this photograph we have been very fortunate to secure a view of the peaks clear-cut against the sky, for often the clouds close in about them and hide them for days at a time, as shown on page 3693.



DO THE STARS FALL DOWN?

CONTINUED FROM 3546

THE things that fall, and are called falling stars, are really not stars at all. If a real star fell into the earth—or, rather, if the earth fell into a star — we should all be burnt up by the heat, long before the earth and the star could meet each other. The things that fall are really quite small stones, or pebbles, or balls of iron and other elements. They sometimes fall all the way to the earth, and can be picked up afterwards. By far the greatest number of them, however, never reach the surface of the earth as stones, or *meteorites*, at all, for they are burnt up, or broken up, into dust by the earth's atmosphere; and a very great deal of the dust in the air, especially in the higher levels of the atmosphere, is made of this meteoric dust, as it is called by men of science.

We see only a few of the falling *stars* that are caught by the earth's atmosphere. For one thing, though they are falling all the time, we never see those that fall in the daytime. They are always made bright and hot as they pass through the air, but they are not nearly bright enough for our eyes to notice when the sun is shining upon our part of the earth. But, as these things are always reaching the earth, and as no matter can be destroyed and made into nothing, quite a lot of the present matter of the earth has been derived from meteors, or falling *stars*, in this way. The dust of them can sometimes be found lying on the snow of the highest mountains, where no other source of dust, such as smoke, is at work to produce it.

WHY DOES LIGHT TRAVEL QUICKER THAN SOUND?

We might reply by asking: Why should light and sound travel at the same rate? or: Why should not light travel slower than sound? If light and sound were waves of the same kind, travelling in the same thing, then it would certainly surprise us if they did not travel at the same rate, and we should want to know the reason why.

But light and sound are waves entirely different from one another, and they travel in utterly different things. Sound travels in gases, such as the air, or in other material things, such as water, or even in solid things. Its speed varies according to the kind of thing it travels through, according to its temperature, and so on. But light travels in something called the ether, which is far more different from any ordinary matter, whether solid, liquid, or gaseous, than we can

imagine. The ether is intensely elastic, and so carries light through it faster than any waves can travel through ordinary matter. No difference in temperature seems to have any effect on the properties of the ether, and so light always travels through it, so far as we know, at exactly the same pace, no matter what the kind of light is—red, or green, or blue. So, also, every kind of ether-wave, light, radiant heat, or electricity, travels through the ether at exactly the same rate of speed.

HOW CAN WE SEE SUNLIGHT WHEN THERE IS NO AIR TO CARRY THE LIGHT-WAVES?

The reason is that the waves of light, though they are carried through the air, are not carried by it. Waves of light are waves in the ether, which is everywhere, whether there is air or not. Air carries waves of sound, which are usually waves of air, though they may be waves of other things besides air. But waves of light are always waves of ether, and nothing else. Air and other forms of matter, whether gaseous, like air, or liquid, like water, or solid, like glass, can have light-waves passing through them, because the ether is everywhere—even in glass or anything else—and it is the ether, whether air, or water, or glass, be there, too, that carries the light. Ordinary matter, such as that of air or water or glass, only interferes with the passage of light—perhaps reflects it or absorbs it. The real question that might be asked is rather different, then, from this question. It should be: How can we see the light of the sun, if the air gets in the way of the waves of light in the ether?

WHAT MAKES AN ELECTRIC LAMP GLOW?

The electric light is quite different from the light of a fire, or a lamp, or a gas-jet, because it is not made by anything burning. So electric light does not use up the air of a room. When we turn it on, we simply allow the current, that has been made somewhere else, to run through the lamp. When the switch is off, the current does not run through the lamp, for there is a space, or break, between the metal wires that carry it. When we turn the switch on, we make the connection between the wire in the wall and the wire that runs to the lamp. If someone takes off the cover of the switch for us, we can see this. When the current runs through the lamp it meets with a certain amount of resistance from the wire, or thread, in the lamp. The thread is very thin, and the electric current, in forcing its way through, makes the thread so hot that it glows, and that gives the light. We know that we cannot get something out of nothing, and what happens here is, that part of the electricity is changed into the heat that makes the thread inside the lamp glow. The greater the flow of electricity, the hotter and brighter the thread gets, and the more electricity is used up. If there were air inside the lamp, the thread would burn away in a moment; but the lamps are so made that there is almost no air at all inside them. If we break the glass of the lamp, and admit the air, the thread will burn and snap in a moment when we turn the current on.

WHAT IS THE FORCE IN LIGHTNING THAT KILLS A MAN SO QUICKLY?

We use the word lightning to mean two distinct things—first, the light that is seen when electricity passes strongly from a cloud to the earth; and, secondly, the electricity which causes that light. The light itself is quite harmless. It may be seen at a great distance from the place where the lightning really passed, but whether it is seen from afar, or close at hand in a blinding flash, it cannot hurt anyone.

But the electricity itself is very different. If this strikes the ground close beside a man, it will do him no harm; but, if it actually passes to the earth through his body, it may kill him. It does this very suddenly, as a rule, by affecting the brain and the nerves that run from it to the heart. As we know, two of these nerves, one on each side of the body, are capable of stopping the heart altogether, if they act powerfully. The electricity, in passing, stimulates, or excites, those nerves, so that they stop the heart, and the person dies from shock.

WHERE DOES LIGHTNING GO WHEN IT REACHES THE GROUND?

The lightning is the light caused by the passage of an electric current, or electric discharge, as we say. It is only a momentary consequence of the passage of the electricity; and, when the electricity has passed, the lightning-flash ceases, for there is nothing to make it flash any more. It is not the

lightning that reaches the ground, but the electricity; and that passes into the earth, and there causes changes which we are only beginning slowly to understand. It is changed when it enters the earth, and has an effect upon the soil, and, we are now sure, upon the life contained in the soil.

CAN A FIRE LIGHT ITSELF?

An ordinary fire cannot light itself, nor can any of the ordinary fuels that we use light themselves. If they did, they would be impossible to control. The reason why the fire laid in the grate, or the methylated spirit or oil in the lamp, does not light itself, though there is plenty of oxygen near it, is that neither coal, wood, paper, spirit, nor oil can burn—that is, combine with oxygen—except at a high temperature. When we light the fire, we produce that temperature, and then the fire itself maintains it. If a thing, in burning, does not produce enough heat to keep it burning, then it will always go out, unless we keep it warm. The ordinary heat of the sun is not sufficient to light wood or paper, but we know that, by using a burning-glass, we can char paper. It may be that, in some cases where a fire has started, and no one can say why, something has acted like a burning-glass to the sun's heat-rays, and so the sun has really lit the fire.

CAN PLANTS BE GROWN BY ELECTRICITY?

It has been thought for some time that the passage of electricity from the air to the earth, which is probably always going on to some extent, must have an effect on the life of plants. We know how valuable light is for plants, and electricity, we know, too, is very like light, though it happens that we cannot see it. Lately, fields of various plants, including the wheat-plant, which is so important for our lives, have been covered, at a little height, with electric wires, so arranged that electricity passes from them into the earth. The wires are placed on poles high enough for anyone to walk under them. And it has been proved that the increase in the amount of electricity that passes into the soil, or perhaps the amount that passes into the leaves of the plants, is *enormously* valuable. The plants grow more quickly and strongly; and they produce far more wheat, or potatoes, or whatever the crop may be. Plants, then, can be grown by electricity. Of course, they must have light and air, and food in the soil as well, and it now seems probable that all green plants grow largely by the aid of electricity, which is the reason why they grow so much better when we supply them with more. This discovery is one of the most important ever made about the growth of plants, for it promises that we shall be able to feed, say, twice as many people from a field of corn as we could before. People living on an island, which they cannot make any bigger, and where they cannot grow all the food they need, will see what a matter of importance this is.

WHY IS THE SUN BRIGHTER AT NOON THAN EARLIER OR LATER IN THE DAY?

The sun seems hotter and brighter when it is high in the sky, and seems hotter and brighter in the tropical regions, just because its light and heat pass more directly down through the air, instead of passing through it slantwise, and so having a longer journey through it. Everyone can understand that this must be so in the case of the ocean, and that the light-waves striking through it are lessened, so that the bottom of the ocean must be almost quite dark. Our minds and eyes can see how water must interfere with the passage of light, so that the sea must get dark very quickly as we go down; but the mind's eye cannot see so easily that the same must be true of the ocean of air, just because we are slow to realise that the air, though it is less dense than the ocean, is quite as material a substance, and therefore it must offer an obstacle to the passage of light.

The air allows a great deal of sunlight to pass through it—enough for us to live by—but no one yet knows *how* it is that any transparent thing, such as air, or glass, interferes so very little with the passage of ether-waves through it.

WHY, IF THE SUN REMAINS THE SAME, ARE SOME DAYS HOTTER THAN OTHERS?

There are several answers to this question. It may be that, though the sun itself has the same heat, its rays do not pierce through the air so directly on one day as on another, but much more slantwise. That is the great difference between a winter day and a summer

day. The less distance of air the heat passes through, the more we feel it. Then, again, if a warm wind is blowing past us, the day will be hotter than if a cold wind is blowing. That is to say, the heat of the day largely depends upon the wind, as well as upon the strength of the sun. Lastly, if the air contains a great deal of water-vapour, it can take up so much less from our bodies, and our perspiration does not evaporate, which means, form into water-vapour.

It is this evaporation of the perspiration from our skin that plays the chief part in keeping our bodies cool, though we are always making more heat as we live. If the evaporation of the sweat is made slow by the fact that the air already holds nearly all the water-vapour that it can hold, we get warm, and say that the day is hot. It may not really be any hotter than another day which feels far cooler; but we judge by our feelings, and they are largely determined by the freedom, or the difficulty, with which we dispose of the water that is continually poured out by our skin and from our lungs.

IF THE MOON HAS NO AIR, WHERE HAS ITS ATMOSPHERE GONE?

In this very interesting question we assume that the moon once had an atmosphere. But, plainly, we have no right to assume this. We must first try to find out whether it did have an atmosphere, and *then* we can try to discover where the atmosphere has gone. Astronomers believe that we are right in assuming that the moon once had an atmosphere, or coating of gas, as the earth possesses. There is even some evidence to suggest that, probably, there are a few remnants of the moon's atmosphere left in its deepest valleys; and this would help to account for the slow and small, but certain, changes that still go on upon the moon's surface, just as the earth's atmosphere helps to account for the many changes that occur on its surface.

An atmosphere is a gaseous envelope, and, in the study of the way in which worlds are made, we are sure that the production of such envelopes at an early stage must be the rule. And, to take an instance, we know that Mars has an atmosphere. But astronomers would even then hesitate to say that the moon once had an atmosphere, if they were at a loss to explain where it can have gone. Fortunately, we *can* explain this. When we study the movements of the atoms and molecules of gases, we learn that they must rush away from a planet, or a moon, unless it is so large that its gravitation can hold them to it. The earth's gravitation holds the air to it. Mars is smaller, and so cannot hold to it such a dense atmosphere as the earth; the moon is very small, and can hardly hold any atmosphere to it at all. All the tiny atoms of gas have flown off into space, but no one knows exactly where.

WHY DOES THE MOON NOT SHINE BY DAY?

The moon and the stars *do* shine by day, though we cannot often see them! And the sun shines by night, only we cannot see it. We are unable to see the sun shining at night, because we are on the opposite side of the earth to it. We cannot see the moon or stars shining by day, because the sun is so bright that the stars are *put out* altogether, unless the sun is eclipsed, when they are seen to shine; but it is not so bright as to prevent us from seeing the moon altogether. Of course, there are times in the month when the moon rises at sunset; but when the moon rises in the daytime it can often be seen; and, if it is seen, it is shining, though apparently it is not shining so brightly as it does in the darkness of night.

WHY DOES THE MOON GROW BRIGHTER AS THE SUN SETS?

If we watch the moon as the sun begins to set, we shall see it grow brighter and brighter, until, when the night has come, it is quite bright. Of course, it has really been shining just the same all the time, but the sun is sending so much light to our eyes, both directly and reflected from the air, that the light of the moon seems pale, and not worth calling even *moonshine*.

It is the same with all our opinions and feelings. One person in a room may shine so brightly by his talk that other people do not seem to shine at all; but when he goes we notice that they are shining, too. And, if we have a headache and suddenly knock our shin hard against something, we shall not feel the headache until the stronger pain in our shin has passed away. The sun *puts out* the moon just as it *puts out* the fire; it does not really do so, but it seems to our eyes to do so.

WHY CAN WE PUT OUT A CANDLE BY BLOWING?

The candle, like a fire, goes on burning after it is lit, because it produces heat enough to warm the stuff of which it is made up to the temperature at which it combines with oxygen. The wax of the candle is made into gases by the heat, and these hot gases are burnt with the oxygen of the air. If we blow the candle, we blow away the hot gases with our breath, and, though our breath is warm, it is not nearly warm enough to keep the candle alight. What really happens, then, is that, by blowing, we lower the temperature of the candle to a point below that at which the stuff of the candle and the oxygen of the air are capable of combining with each other. We thus put the candle in the same state as it was before it was lit, and it will not start burning again until new heat is supplied to it by another match.

DOES THE EARTH MAKE THE AIR THAT WE BREATHE?

The air that we breathe is part of the earth, and has been so from the earth's beginning. At one time, the whole of the earth must have been gaseous, and what we now call the air is simply the part of the earth that is still gaseous, and, being lighter than the solids or the liquid part of the earth, lies outside these, and forms a thick, unbroken envelope for them both. Any sun or planet that is large enough has an envelope of gas round it. We should not say it *made* this envelope, but that the envelope is the part of it that has remained gaseous.

It would really be just as reasonable to ask: Does the earth make the water that we drink? It is true, however, that the earth makes its own air, in the sense that the composition of the atmosphere is always being changed by the things that happen at the surface of the solid earth, or at the surface of the seas. Gases are passing into the atmosphere from living creatures and from the sea, and other gases are passing from living creatures and the sea to the atmosphere. Every shower of rain alters the composition of the air in some degree, and so does every breath we breathe.

WHY DOES THE AIR NOT STOP THE LIGHT OF THE SUN?

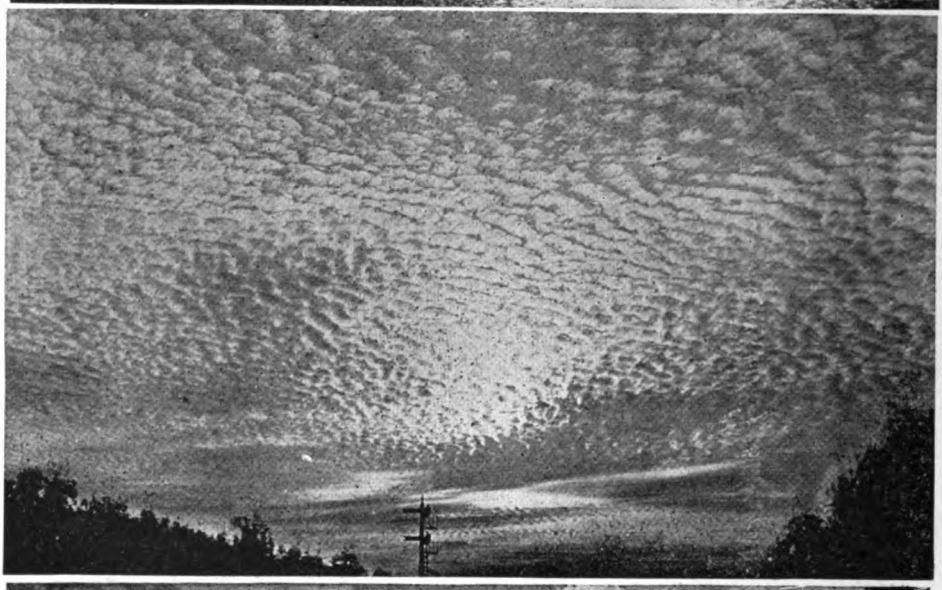
The air *does* stop a great deal of the light of the sun. We know that rays of heat and rays of light are really of the same kind, and the sun sends out both. The air stops a great deal of both. The sun and the moon and the stars are far brighter when we go up in a balloon, or if we look at them through a telescope on a high mountain, instead of one near the level of the sea. The reason is that their light has to pass through less air to reach our eyes. The air is a great blanket, and prevents the passage of light and heat to a great extent, whether from outside space to the earth, or from the earth to outside space. If there were no air, the light or heat of the sun, striking the earth, would be vastly greater than it now is. The moon has no air. If it had, even although there were no water in it to form clouds, the moon would be not nearly so brilliant as it is, for a great deal of the sun's light would be absorbed by the air.

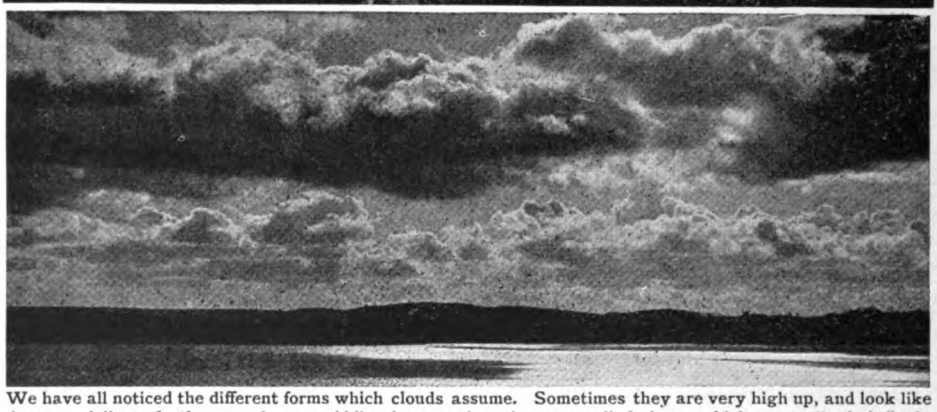
WHAT IS IT LIKE ABOVE THE CLOUDS?

When we go up in a balloon above the clouds, or when we go so high up a mountain that we leave the clouds beneath us, we find exactly what we expect. The air is very bright and clear, and the sun—or the stars, if it is night—are seen very distinctly. Both sides of a cloud are very much the same, and when we look down on the clouds from above, they appear just the same as bright clouds appear from the earth. They are, of course, always bright clouds that we see from above, because we are looking at the side of them upon which the sun is shining. We find much the same thing if we go up in a balloon through a London fog.

Some astronomers who did this found that, at a height of several thousand feet, the balloon soared clear of fog, and came out into brilliant sunshine. They saw the fog beneath them, but, of course, they saw it as a quite bright thing, as a great deal of the sunlight which should have been pouring down upon London was stopped by it, and reflected back from its surface to their eyes. When there is no fog, but only clouds scattered about, and we go up above them in a balloon, we get glimpses of the earth between them as we look down; and those who have seen this say that it is a very wonderful sight. Of course, they do not see the earth spinning underneath them, because the air spins round with the earth, and the balloon spins round with the air.

THE CHANGING BEAUTIES OF THE CLOUDS





We have all noticed the different forms which clouds assume. Sometimes they are very high up, and look like down or delicate feathers, as in our middle picture, when they are called cirrus, which means "a hair." At other times the clouds look like great masses of wool or wadding, as in the bottom picture, and then they are called cumulus, or "woolpack" clouds. Heavy black rain-clouds are known as nimbus, while those that stretch in straight lines across the sky are stratus. We often see clouds that are partly one kind and partly another, and they have such names as cirro-cumulus, cumulo-nimbus. In the top picture we see cumulo-stratus clouds.

The photographs on these pages are by J. Valentine and others.

A MOUNTAIN TOP ABOVE THE CLOUDS

We should hardly think that the snowy peak seen in this picture was the highest mountain in the world, for other pictures, like that on page 2502, show mountains that seem higher. But when a mountain is situated among other very high peaks, as this is, it never looks so high as if it stood alone. This picture of Mount Everest, in the Himalayas, was taken from a place near Darjeeling, which is over 7,000 feet high, and from that point we are looking down upon banks of clouds. Mount Everest is 29,002 feet, or exactly five and a half miles, high, and it was named after Sir George Everest, a great official surveyor in India.

WHY DO SO MANY PIPES BURST DURING FROSTY WEATHER?

We know already that water has a great peculiarity in the way it behaves when it is cooled. The rule is, that a thing contracts and shrinks as it cools, and if water is cooled down to within a few degrees of its freezing-point, it obeys this rule. But if it is cooled still farther, it then begins to expand, until it freezes and turns into ice. So ice occupies more space than the liquid water which is nearly cold enough to turn into ice, but not quite. When the frost comes, it often freezes the water in the pipes in our houses, and, as this means that the water, in the form of ice, occupies more space than it did before it was frozen, it cracks the pipes.

The water, when it freezes, is stretched, so to speak, to form ice, and bursts the pipe that tries to prevent it from stretching or expanding itself. This gives us some idea of the power of its expansion. Of course, as long as the frost continues, we do not notice any bursting of our water-pipes, but, as soon as the thaw comes, the ice in the pipes melts, the water runs out, and causes damage. Many people therefore think that the thaw bursts the pipes, but, as we see, they are wrong. The frost bursts the pipes, and the thaw only shows us that they are burst.

WHAT IS THE BLUE LIGHT THAT WE OFTEN SEE ON THE SEA AT NIGHT?

This is sometimes called phosphorus, but it is not well to give it that name, for phosphorus is the name of a particular chemical element, and the light on the sea has really nothing to do with phosphorus.

But phosphorus itself shows this light, and so the light gets its proper name, which is *phosphorescence*. The light on the sea, and the light shown by phosphorus when it is exposed to the air, or to oxygen, are due to the same cause, the occurrence of slow burning, or combustion, or oxidation. There is no free, uncombined phosphorus in sea-water, and, though there are salts containing phosphorus, called phosphates, in it, they have nothing to do with its phosphorescence.

But the sea is really full of living matter, and of matter which has been alive—the bodies of dead sea-creatures, some animal and some vegetable. These are slowly oxidised by the oxygen which is dissolved in the sea-water, and has been got from the air, and as they are oxidised, or burnt, they give out the faint light which we see.

WHY IS IT EASIER TO WALK ON A ROUGH SURFACE THAN ON A SMOOTH ONE?

We might add to this question, Why is it easier to walk in boots that have nails in them than in new boots with slippery soles, and why are we wise to score the soles of new boots with a knife to make them a little rough? The answer to all these questions is the same, and it is that the roughness, whether it be on the ground, or on the soles of our boots, means friction, and without friction we cannot walk. Friction, or, to use a more familiar word, *rubbing*, means that the boot cannot slide along the surface of the ground, but stays without difficulty wherever we put it, and so walking is easy.

If we try to walk on ice with skates, we shall soon learn how important friction is for easy walking. We learn, too, that we *can* walk even without much help from friction, but, in order to do so, we must balance ourselves very carefully, so that there is no tendency for the boots to slide in any direction. As long as the weight falls equally on the whole of the boot, or the skate, there is nothing to make it slide, but it will slide if the weight falls unequally, unless friction prevents it. If there is enough friction, as there is when we walk on a rough surface, we can take big steps, and need not trouble to balance our bodies carefully, for the friction will prevent our boots from slipping or sliding along the ground.

WHY DO OUR HANDS REMAIN DRY WHEN DIPPED IN QUICKSILVER?

Mercury, or quicksilver, is a true liquid, just as much as water is, and it can flow just as water can, if the conditions are right. When we dip our hands in water and withdraw them, the water clings to the skin; so that it wets the hands. There is sufficient attraction between the water and the surface of the hands to make this possible; though, even in the case of water, it all depends upon circumstances. For instance, we may coat our hands thickly in oil, and then we find that the attraction between the water and the oil is so small that our hands are not wetted, or scarcely wetted at all. Mercury

behaves to the hand in its ordinary state as water does to the oil-covered hand. Also, mercury is a very heavy thing, and so tends to fall back when the hand is withdrawn, even though some of the mercury may try to cling to it. Even when the hand is perfectly clean, it is still much more oily than we think, and it is not possible to free the hand entirely from oil, for the skin of the hand actually produces oil to some extent. But if we use something that is *quite* free from oil, we can sometimes get mercury to flow over it and wet it, in just the same way as water would, though never so freely as water will.

HOW CAN A FEW IRON RODS BEAR THE WEIGHT OF A SUSPENSION BRIDGE?

Well, in the first place, it very much depends upon the iron. No one would trust very much to a suspension bridge made of any ordinary kind of iron. But if we *melt*—for that is what we really do—the right proportion of carbon in the iron, and get them to mix and hold together in the proper way, then we get a new kind of iron, which is vastly different and vastly stronger. It is this steel, as we call it, of which suspension bridges are made. No human being can say how or why it is that steel has the wonderful property upon which the building of suspension bridges depends. All we can say is, that steel has a wonderful power of resisting anything that tries to extend or stretch it. This power of resisting extension is called tensile strength. The tensile strength of good steel is amazing, and in the last few years steels still more wonderful have been made, thin wires of which will support enormous weights. But let no one suppose that mere iron can be trusted, as iron can when it has other things rightly added to it to make steel.

WHAT MAKES US RED WHEN WE ARE HOT?

When we say we are hot, we mean that we feel hot. A man may be really very hot and yet feel cold—as in the fever called malaria—because there is little warm blood in his skin, and it is the skin that holds the heat-nerves. When we *feel* hot, the skin is being supplied with a lot of blood. This need not be unduly hot blood; it may be blood of the right temperature, as when we blush, and *feel hot all over*.

The quick supply of warm blood rushing through the skin affects the heat-nerves, and so we feel hot. Of course, when there is an unusual amount of blood in the skin, its colour shows, and so we look redder than usual. So the question would be just as right if it were put in this form: What makes us feel hot when we are red? When we have been burnt, or have had our chest rubbed with camphorated oil, or when we have a red skin from exposure to the sun, that part of the skin feels hot, and the heat-nerves feel the warmth of the unusual supply of blood around them.

The question has another answer. The reason why we get red when we are really hot, as in fever, or when we have been running hard and making a lot of heat in our muscles, is that the excess of heat must be got rid of. So the blood is allowed to flow more quickly and freely through the surface of the body—causing us to become red—and there it is made cooler.

WHY HAS WATER NO TASTE?

It is perfectly true that pure water has no taste, but probably not one in ten thousand of those who read this question have ever tasted water that had no taste. None of us have ever tasted pure water, unless we have been to the chemist's and have tasted water that has been distilled. The ordinary water we drink has quantities of air dissolved in it, and these give it a taste. It also has a certain amount of salts dissolved in it. If we boil water, we drive off the gases in it, and then it does become tasteless and flat. That is the reason why one of the many ways in which to spoil a cup of tea is to let the water *go on* boiling before we make the tea. Why pure water should have no taste is very plain. Our bodies mainly consist of water. The nerves of taste, and their endings in the tongue, mostly consist of water themselves, and they live in water. Therefore we should not expect water to be one of the things that excites them. If it were, we should be tasting it all the time. There would be no use or meaning in this, and all our senses exist for use. Their business is to tell us of new things happening, not of things always there. So water, therefore, has no taste, and air no smell.

The next Questions are on page 3755.

THE MAN WHO MADE THE WORLD HIS PARISH

John Wesley has been called the man who saved England, for when he began his preaching the people in many parts of the country were practically heathen. And yet this man was almost lost to us. When he was but six years old his father's house was set alight by evil men, and John, who had been forgotten in the excitement, was only rescued from a window at the last moment. An instant later the burning roof of the house fell in.

When, after his long and splendid life, Wesley lay on his deathbed, with a few of his most intimate friends gathered round, he tried to repeat a verse of a psalm, but his weakness was too great, and all he could say was: "I'll praise—I'll praise." Then with a last "Farewell!" he passed to his rest, while his friends wept and prayed.

This is the kind of scene that moved the great social reformers to change the conditions of child-life. Little boys were bought from their parents by sweeps, and made to climb up inside chimneys to clean them.

SOME ENGLISH REFORMERS

CONTINUED FROM 3574

LORD SHAFTESBURY

We often find in books some reference to the Edict of Nantes. That Edict of the French king, Henri IV., allowed French Protestants to live peacefully in their native land. But in the year 1685 this humane Edict was withdrawn by Louis XIV., and the poor Protestants were exposed to such brutalities that many of them fled from France, never to return. Among the many French families driven to England was one named Romilly. The first Romilly settled near London, as a wax-bleacher; his son became a jeweller in Soho, and *his* son, Samuel, became one of the greatest English reformers.

This descendant of French refugees became a barrister. He was successful from the first, because he gave his conscience to all he undertook. Lord Brougham said of him: "Romilly, by the force of his learning and talents, and the most spotless integrity, rose to the very heights of professional ambition. He was, beyond question or pretence of rivalry, the first man in the courts of equity in this country." From being the penniless son of a poor working jeweller, he rose to earn an income of nearly $50,000 a year. He became the friend of some of the greatest English families. He entered parliament, and was made Solicitor-General in a Cabinet known as "All the Talents." So powerful was his oratory that, at the end of a speech on the abolition of the slave trade, the whole House of Commons gave three rounds of applause.

But why does the name of Samuel Romilly linger in England's memory? To grow rich and famous is not to purchase eternal honour. He did something more than make a fortune. It was this descendant of French refugees who first purged English law of its most terrible brutality.

In the days when he lived, there were no fewer than 300 crimes punishable by death. If a man kept company with gipsies, or if he stole a dollar's worth of goods from a shop, he was condemned to death. Not only was this punishment wicked, but crime flourished because, as Lord Coke said, "too severe laws were never executed."

Romilly set himself to alter this state of things. Instead of enjoying his wealth, and passing delightful days in the company of clever and charming people, he devoted the

energy of his mind, he consecrated the hours of his life, to the sacred cause of Justice. Again and again he failed; indeed, if we look at what he actually accomplished, we may say that he never succeeded; but because he did not lose heart, and because he repeated his efforts in the face of defeat, and never doubted that truth would triumph, other men after his death, in a less cruel age, carried his pioneer work to a successful conclusion. To-day, the English Law punishes only one crime with death. This great triumph is the result of the work begun by Sir Samuel Romilly.

Of all the works possible to men, none is greater than making other men *better*. We must think of what that word *better* means. It means making a cruel father, a loving father; a bad mother, a good mother; a liar, truthful; a drunkard, sober; a thief, honest; a sinner, pious. It is not difficult to make men happy, or clever, or cheerful; it is most difficult to make them good. And remember, there is no man living, however good he may be, who might not be better; for the progress of man is eternal. It is because making men better is the supreme work in the world, that John Wesley shines on the page of history like a star of the first magnitude.

JOHN WESLEY, WHO SPENT HIS LIFE IN SAVING ENGLAND

He not only made a few men better, but he made hundreds of thousands of men better. And this, too, in an age which was apparently dead to religion, dead to seriousness, dead to everything that was not frivolous, empty, and vain.

And how did John Wesley do this great work? How was it that he saved the soul of England in the eighteenth century? He mounted a horse and rode to all those parts of England where the respectable working classes lived, and preached to them the religion of Christ. He avoided the rich; he did not seek the hopelessly vile; in order to save both the rich and the vile, he made his appeal to the magnificent forces of England's working class. And the working class saved England.

John Wesley was a clergyman's son. His father had nineteen children. John Wesley was used to no luxuries. His mother whipped her children in order to teach them to cry softly. He was strictly trained, but the harshness of his childhood could not destroy in him the glowing light which illumined his noble spirit—the light of God's love. He believed implicitly that God *loves* every man, woman, and child; loves them, and desires them to be good only that they may be capable of appreciating the great joys which, after death, await those who love what is right, and hate anything and everything that is evil.

HOW A POOR MAN GAVE AWAY 150,000 DOLLARS

When he went to Oxford, Wesley had $150 a year; he lived on $140, and gave $10 away. Next year he had $300; he lived on $140, and gave $160 away. Next year he had $450, and the year after $600; he still lived on $140 a year, and gave the rest away. It is said that during his life he gave away $150,000.

There were some very foolish men in the Church of England at that period, who so ill-treated Wesley and disheartened him that he worked on his own lines. He built chapels wherever he went, organised a great society of worshippers, and preached in the fields and in the streets to anybody who would listen. Sometimes he was roughly used by the mob, but he never lost heart. He used to travel some 5,000 miles every year, generally on horseback. "No man," it has been said by a living statesman, "did such a life's work for England."

He lived to be eighty-eight, and almost his last word was the joyful exclamation: "The best of all is, God is with us!". That was the secret of his life. He felt that God was with man, helping, in His own wise and patient way, the work of improving the human race. Among the English heroes, all should always be proud of Wesley.

A MAN WHO USED TO RISE AND PRAY IN THE MIDDLE OF THE NIGHT

John Howard was a queer, quaint, delicate, and studious man. He fell ill as a young man, when he was living in lodgings, and not knowing how to express his gratitude to his landlady for all her kindness to him, insisted upon marrying her. He was just over twenty, and she was just over fifty. He used to get up at two o'clock in the morning, in the bitterest winter weather, to examine a thermometer at the bottom of his garden. He did not eat animal food. He had usually left his bed and

said his prayers before three o'clock in the morning. He studied astronomy, meteorology, and medicine, and spent much of his time in foreign travel.

THE GREAT EVILS THAT JOHN HOWARD FOUND IN THE PRISONS OF THE WORLD

He might have gone on living this strange and eccentric life to the end of his days, if he had not been elected the sheriff of Bedford. John Howard was a man who did thoroughly what he had to do, and his business as sheriff lay with the prisons of the county. Most sheriffs ignored this part of their work, but John Howard was of a different character. He inspected the prisons, and found them horrible. Not only were the cells reeking with damp, and absolutely soul-killing in their darkness and wretchedness, but the gaolers and turnkeys were allowed to do practically what they liked with their prisoners. A rich prisoner could buy luxuries and bribe the gaolers to procure him comforts; a poor prisoner was neglected, starved, bullied, and cruelly treated in every possible way.

Horrified by what he found, John Howard passed into other counties. The same thing happened there. He visited foreign countries, and saw the same barbarity and wretchedness. He not only comforted poor prisoners, and did all he could to better their condition, but he addressed kings and governments in the name of humanity, and said that this evil thing must end. His revelations shocked the world. Men stood aghast at the cruelties perpetrated in the name of justice. An immense shame took hold of the human heart that such things could be done by men to men. "Man's inhumanity to man"—that is one of the most terrible things in the world. Instead of making bad men good, prisons hardened them, and made them worse. As for the innocent, the prison broke their hearts, and drove them mad.

HOW A GREAT ORATOR PRAISED JOHN HOWARD'S WORK FOR HUMANITY

Edmund Burke, the great orator, said of John Howard: "He has invited all Europe, not to survey the sumptuousness of palaces, or the stateliness of temples; not to make accurate measurements of the remains of ancient grandeur, nor to form a scale of the curiosities of modern art; not to collect medals or to collate manuscripts; but to dive into the depths of dungeons, to plunge into the infection of hospitals, to survey the mansions of sorrow and pain; to take the gauge and dimensions of misery, depression, and contempt; to remember the forgotten, to attend to the neglected, to visit the forsaken, and to compare and collate the distresses of all men in all countries. His plan is original; it is as full of genius as of humanity. It was a voyage of discovery; a circumnavigation of charity."

John Howard died on January 20, 1790, at Kherson, in Russia, while giving medicines to the poor wretches in hospitals. He was buried there, and the Emperor Alexander raised a monument to his memory. England has few heroes of whom she may justly feel more proud than John Howard. His life belongs to all the world, and his memory is preserved by every nation.

A POT-BOY WHO BECAME ONE OF ENGLAND'S GREATEST PREACHERS

Among the most romantic stories of reformers is that of George Whitefield. In some ways it is one of the most telling stories in the chronicles of religion. For George Whitefield, who was destined to waken the religious sense in thousands of human beings, and who had for his admirers such sceptical men as Hume, such triflers as Lord Chesterfield, such conceited philosophers as Bolingbroke, and such original men as Benjamin Franklin, was born in an inn, spent his boyhood among low characters, and for many years served ale and washed mugs in this tavern kept by his mother at Gloucester.

While forced to do this work, his education was not altogether neglected, and at the grammar school he was so praised for the beauty of his voice that he felt tempted to try his fortune on the stage. But, mysteriously enough, there was a deep religious impulse in the boy. He was conscious of God. He felt the horror of sin. He realised that life is something more than an idle show. Therefore, when he discovered that it was possible for a poor lad to go to Oxford as a servitor, receiving part of his education in return for waiting at table, he embraced this opportunity, and entered the university at the age of eighteen. The Methodists—so called because

they lived by rule and method—were beginning to attract attention, and Whitefield joined their fellowship and practised the most severe habits of existence. He was ordained deacon in 1736, and two years later set out for Georgia, in America, at the invitation of Wesley. The effect of his preaching is told by Franklin, who once heard Whitefield appealing for funds towards a scheme of which Franklin did not approve.

"I silently resolved he should get nothing from me. I had in my pocket a handful of copper money, three or four silver dollars, and five pistoles in gold. As he proceeded I began to soften, and concluded to give the copper; another stroke of his oratory made me ashamed of that, and determined me to give the silver; and he finished so admirably that I emptied my pocket wholly into the collector's dish, gold and all."

GEORGE WHITEFIELD, WHOSE POWERFUL PREACHING MADE BAD PEOPLE GOOD

Whitefield spent his life in preaching. He journeyed all over the British Empire, and everywhere he went people flocked to hear him, and, by his wonderful preaching, were converted to live better lives. The sceptic Hume has told us one of Whitefield's appeals: "After a solemn pause, Mr. Whitefield thus addressed his audience: 'The attendant angel is just about to leave the threshold and ascend to heaven; and shall he ascend, and not bear with him the news of one sinner, among all the multitude, reclaimed from the error of his ways? . . . Stop, Gabriel! Gabriel, stop ere you enter the sacred portals, and yet carry with you the news of one sinner converted to God!'"

When he preached in London early on winter mornings, the streets near the chapel would be bright with lanterns carried by the multitude flocking to hear him. When we think of his origin, and the terrible atmosphere in which the impressionable years of his boyhood were spent, are we not amazed that by speaking of God this man should have drawn hundreds and thousands of people to forsake idle, evil, and useless lives for the pure, unselfish, and helpful life commanded by Christ? George Whitefield teaches us that more can be done by speaking of God than by laws made by men. He did not change the conditions of men's lives; but he changed the lives themselves. William Wilberforce was first known as "the Nightingale of the House of Commons," because of his beautiful voice and his skilful eloquence—eloquence that always held his listeners spellbound.

WILLIAM WILBERFORCE, WHO BECAME THE CHAMPION OF THE SLAVES

He lived to earn the greater and grander title of "the good Wilberforce." He was born in Hull, the son of a successful merchant, and from youth was of a benign and gentle nature. He went to Cambridge, and travelled about with William Pitt and Dr. Milner, enjoying the sights he saw, and forming his judgments on religious questions. When he returned to England his life was consecrated to the service of the Christian religion, and he entered the House of Commons to make right reason and the will of God prevail. All his speeches were on the side of justice, honour, and goodness. Finally, he became the champion of the oppressed slaves, the burning denouncer of the terrible and degrading slave-traffic.

In his first great speech on this question he described the slave-trade as the most complete system of injustice and cruelty exhibited to the world. "In other evils," he said, "some good might be detected. Hurricanes purify the air; persecution excites enthusiasm for truth; pride, vanity, and profusion frequently contribute, indirectly, to the happiness of mankind. There is nothing, however odious, that has not its palliative; the savage is hospitable; the brigand is intrepid; violence is, in general, exempt from perfidy; and daring iniquity from meanness. But there is no benign concomitant here; it belongs to this hateful traffic to deteriorate alike the good and bad, and even to pollute crime itself; it is a state of warfare undignified by courage; it is a state of peace in which there is no security against devastation and massacre."

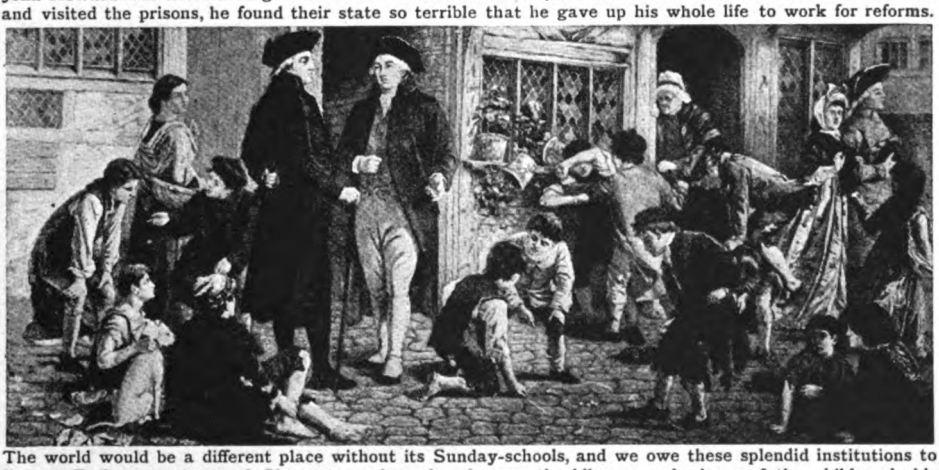
HOW WILBERFORCE BELIEVED IN DOING RIGHT, WHATEVER HAPPENED

Against these arguments was raised one objection. The traffic was wicked and inhuman, but it was useful to the empire. At this the eloquence of Wilberforce blazed forth with righteous indignation. "What is it," he cried of this argument, "but to establish a

THREE MEN WHO CHANGED THE WORLD

George Whitefield's preaching stirred the people to their depths, but he was often mobbed, and here we see him preaching while a drum and trumpet are played to drown his voice, and a man is about to strike him.

John Howard was a cultured gentleman of comfortable income, but when he was elected sheriff of Bedford and visited the prisons, he found their state so terrible that he gave up his whole life to work for reforms.



The world would be a different place without its Sunday-schools, and we owe these splendid institutions to Robert Raikes, a printer of Gloucester, who, when he saw the idleness and misery of the children in his native town, and their confirmed gambling habits, started a Sunday-school to teach them better things.

competition between God and Mammon, and to adjudge the preference to the latter? What but to dethrone the Moral Governor of the World, and to fall down and worship the idol of interest? What a manifesto to surrounding nations! What a lesson to our own people! Come, then, ye nations of the earth, and learn a new code of morality from the parliament of Great Britain. We have discarded an old prejudice; we have discovered that religion, and justice, and humanity are mere rant and rhapsody!" He boldly declared that if these principles were accepted the whole orb of civilisation would be shattered. "Men must then retire to caves and deserts, and withdraw from a world become too bad to be endured."

We see what William Wilberforce stood for. It was for Right, whatever the consequences. He believed in one God; he made no obeisance to Evil.

His burning eloquence converted England. From his place in the House of Commons this noble Englishman broke the chains of slavery and released thousands of slaves to become men in the world of men. The hideous torture of the slave-traffic ceased, and one of the foulest blots on the flag of England was wiped away by the hand of this great reformer.

ROBERT OWEN, THE MAN WHO MADE THE FACTORY CLEAN AND HEALTHY

Robert Owen is a name that meets us frequently when we grow up. What did he do? What was his work in the world which has endured? He was one of the very first men to improve the terrible conditions of the factory people which existed at the beginning of the last century. To-day labourers flock from the country to work in factories. When Robert Owen lived, no respectable country person would enter one of these places. They were filled with the lowest of the low—children from pauper schools, and the refuse of city populations; their wages were beggarly, their hours were long, their souls were left to rot.

The great change is the work of Robert Owen. The hours of factories have been limited; children of tender years are no longer employed; inspectors constantly visit these places to see that the workpeople live in proper sanitary conditions; a factory hand is now an intelligent, sober, self-respecting and industrious citizen. Robert Owen began life very humbly. His father had a small saddlery and ironmongery business in North Wales. At ten years of age Robert was working in a shop. He was a clever, practical boy, and went on advancing until he became manager of a cotton-mill in Manchester.

HOW ROBERT OWEN'S FACTORY BECAME THE MODEL FACTORY OF THE WORLD

While he was still young he became the part-owner of a cotton-mill in New Lanark. It was here that his great work began. He shortened the hours of labour, he established schools for the children, he opened a store where the workpeople could buy food and clothes cheaply, he improved their dwellings and taught them habits of thrift and cleanliness. It comes as a shock to hear that the people who had money invested in this mill rose up against Robert Owen because he was spending so much money on the workpeople. That is what happened. But Owen's noble work had attracted the attention of good people throughout the country. His mill was visited by reformers, philanthropists, and royalties. It was considered the model factory of the world.

But when his partners quarrelled with him it was difficult for him to get money enough to start another mill. There were many people ready to help him. Parliament listened to him. He was reckoned to be the one man who could solve the great problems of poverty and crime. All the world, indeed, was looking at Robert Owen.

THE SAD FAILURE OF A REFORMER WHO FORGOT GOD

And then a sad thing happened. This good man was perfectly deaf to the searching question of religion, "What shall it profit a man if he gain the whole world and lose his own soul?" He though it was enough to provide people with good houses, fair wages, and sufficient time for leisure. He was interested in their minds, their stomachs, and their limbs. He thought nothing of their souls. And so it happened, that when people discovered that this good man was shutting God out from His own world, many turned against him. He started socialistic communities, but they failed. He lost his money, his

reputation, and his common-sense. His old age was spent among the great folly of superstition known as spiritualism. But the great work that he had started was carried on by religious people, and, since that time, it has never ceased.

To Robert Owen belongs the honour of having founded infant schools in England, and the great reform known as the Co-operative Movement is the work of his hands. If only he had bowed himself before the mystery of life, and had realised man's responsibility to God, he might have done more. But as it is, he accomplished a mighty work for humanity, and we must always be grateful for his unselfish and devoted love.

The life of Richard Cobden is one of the most useful for study of those whose duty it will soon be to carry on the destinies of England. He was a man born with neither the influence of title, the power of wealth, nor the advantage of opportunity. He would have been ill-educated had he not spent his leisure on self-education. He would have been poor had he not devoted himself with conscientious seriousness to earn his wages in a house of business. He would have died without glory or fame had he not laboured to make the will of God prevail among the nations of the world.

RICHARD COBDEN'S FIGHT IN PARLIAMENT FOR CHEAP FOOD FOR THE POOR

We cannot tell here about the great struggle over the Corn Laws, in which Cobden was the triumphant hero. All we need to know is that Cobden entered the House of Commons convinced that the tax on foreign corn was a bad tax; that the members of the House of Commons would hardly listen to him when he first rose to speak; and that in the end food became cheap for the poor. Cobden was acclaimed as a hero, and all the nation acknowledged his great victory.

But Cobden did what some think was a still greater work, and it is this work to which we will pay attention. Let us try to see in our mind a picture of the various nations of the earth. See the Frenchman making his silks, the German his steel, the Englishman his cloth, and the other nations cultivating the earth with the various produce suited to their soils. Beside each worker stand a soldier and a sailor. The workers sell their goods to each other, and they would be well off if it were not for the soldier and sailor. They have to feed, clothe, and arm those fighting men. So the poor worker becomes poorer and poorer, paying to keep these protectors at his side.

THE MAN WHO HATED WAR AND TRIED TO TEACH THE NATIONS PEACE

Suppose now that the Frenchman, the German, and the Englishman said to each other: "We will not hurt each other. We will do our own work, and trade together. Let us agree to do this, and we shall not have to pay for these fighting men, who keep us so poor." What a difference that would make! All the many millions of money spent every year on arming for war would be saved.

This was Cobden's great dream. This was the work he started. Richard Cobden *hated* war. He set his life to try to prevent it. He did not go about raging against soldiers and sailors, who are brave men, and very often noble men. But he went to the various nations and tried to spread among them the common-sense of a common friendship.

Side by side in history with Richard Cobden stands the noble old Quaker, John Bright. He was a private man, following his trade, when the call to become a public man came to him. Death was, in some measure, the summoner. His young wife, whom he loved devotedly, died of consumption. The soul of John Bright was bowed to the dust. But while he was mourning, Richard Cobden came to him.

"There are thousands of homes in England at this moment," he said, "where wives, mothers, children are dying of hunger. Now, when the first paroxysm of your grief is past, I would advise you to come with me, and we will never rest till the Corn Laws are repealed."

THE GREAT APPEAL OF JOHN BRIGHT THAT MOVED THE NATION

That was the call. It roused the mourner from contemplating his own tragedy, to contemplate the larger tragedy of mankind. Instead of thinking of himself, he thought of others. Instead of bowing himself before the grave of his own sorrow, he went forward to ease the sorrows of the world. This simple, self-educated Quaker had nothing in his soul but devotion to God and love towards his fellow-men.

What would have happened to England if this noble man had not forsaken his private grief, and laboured for a repeal of the Corn Laws, it is difficult to think. Want and starvation had brought the people to a dangerous and reckless mood—a mood when reason is thrown away and, like famished wolves, the multitude becomes a pack, urged forward by one impulse—hunger. It was to John Bright that the nation listened. Cobden argued; Bright appealed. His appeal was made to righteousness, to justice, to God. The nation listened, was moved, and was converted.

The long course of Bright's life was devoted to humanity. He made some mistakes, but, on the whole, his record is a splendid one. Like Cobden, he hated war. He did great work for peace. We shall find, as we grow older, that all the heroic work in the House of Commons has been carried forward by deeply religious men. Religion is the supreme impulse. John Bright was one of the great forces in the House of Commons because he did not think of his party, did not seek popularity, but guided his conduct always by the voice of conscience. His life stands out in the annals of England, telling us that it is good men—the men who think of others before self—who save the world.

ROBERT RAIKES, THE PRINTER WHO GAVE SUNDAY-SCHOOLS TO THE WORLD

We owe the Sunday-school—an institution which has accomplished enormous good—to a printer living in Gloucester. This was Robert Raikes, who was born in 1735, and who, at the age of twenty-two, succeeded his father in the printing business. It was not until twenty-three years after this that he started the first Sunday-school.

With a few others to help him, the good printer opened a school for children on Sunday; children who would otherwise have spent the day in the streets came to be taught reading and the Catechism. The venture was so successful that Robert Raikes published an account of it in the newspaper which he published, the "Gloucester Journal." This notice was copied into some of the great London journals, and attracted wide attention. Such was the beginning of our Sunday-schools, and Robert Raikes lived to see his little experiment copied all over England and America.

One of the best aristocrats who ever denied himself the luxuries and pleasures of high estate to minister to the poor and suffering was the great Lord Shaftesbury, who died in 1885. The poor of London loved this man beyond all others of his period. There must be many men in East London who are saying to-day that they owe their happiness to the good earl.

LORD SHAFTESBURY, A GREAT NOBLEMAN WHO GAVE HIS LIFE FOR THE POOR

Lord Shaftesbury was one of the chiefs of the Ragged School Union; for over forty years he was its president; and during those forty years he made acquaintance with thousands of poor boys and poor girls, and encouraged them to live noble and useful lives. He used to go into the East End, visit the darkest slums, and make friends with the vilest and the lowest, as well as with the poor and the suffering.

The good works of the world are numerous, but few have accomplished so much quiet and lasting good as that most merciful and Christlike institution, the Ragged School Union. If we would know what religion really means in the world, we should go to see Sir John Kirk of the Ragged School Union, and ask him to tell us about the work of the good Lord Shaftesbury.

William Morris is a reformer different from any of those we have read about. His life shows us how various are the ways in which a man can work for the improvement of the world. When he was a little boy he would dress up in toy armour, mount a pony, and ride into Epping Forest, dreaming of old romances. He loved flowers. He knew all the animals of the forest. He could recognise any bird by its flight. The little boy was in love with Nature.

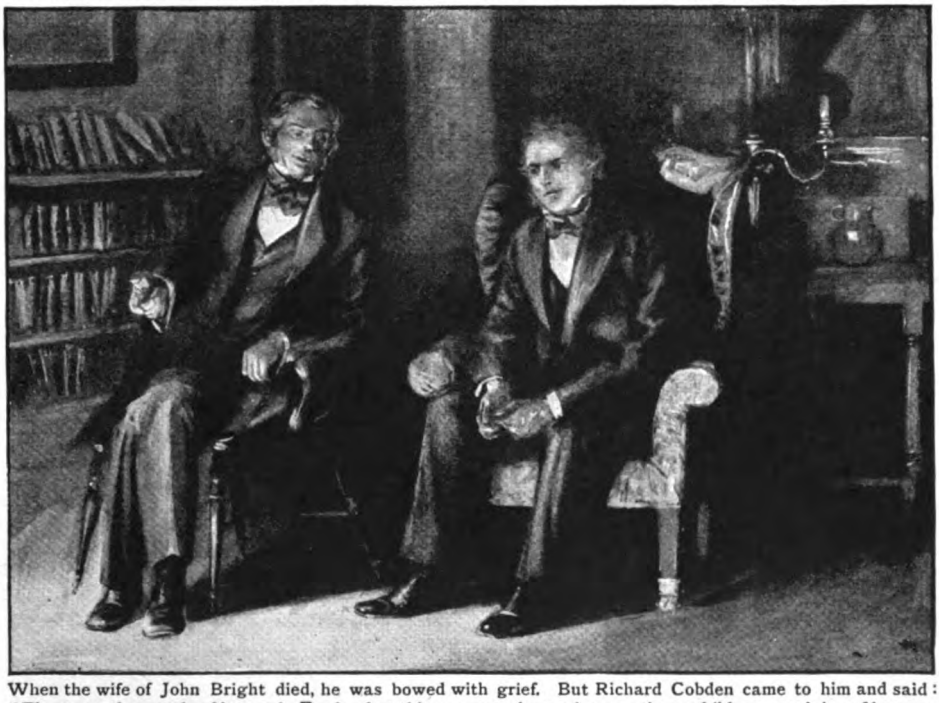
WILLIAM MORRIS, WHO TAUGHT MEN TO STRIVE FOR BEAUTY

When he went to Oxford he wanted to be a clergyman; and there he met another scholar, whose name was Burne-Jones, who had also come to Oxford with the same purpose. These two young men became friends, and in their conversations they talked about making the world a happier place. Gradually it came to them that they could do more work for the world as artists than as clergymen. In those days people cared very little for

FRIENDS OF THE POOR AND OPPRESSED

The only happiness that Lord Shaftesbury knew in childhood was due to a kind servant, who used to take the boy upon her knee, telling him the old Bible stories and teaching him to pray. To his death, the earl always remembered with gratitude the nurse, to whom he owed all that was best in his life.

When Wilberforce discussed the abolition of the slave-trade with his friend William Pitt, the great statesman advised him to undertake the cause in Parliament. Sitting under an old tree at Holwood, in Kent, with Pitt, as shown here, Wilberforce made the great decision of his life to champion the slave.



When the wife of John Bright died, he was bowed with grief. But Richard Cobden came to him and said: "There are thousands of homes in England at this moment where wives, mothers, children, are dying of hunger. Now, when the first paroxysm of your grief is past, I would advise you to come with me, and we will never rest till the Corn Laws are repealed." Bright responded to the call, and the poor received the blessing of cheap food.

The picture on page 3701 of Whitefield preaching is by Eyre Crowe, A.R.A.

beauty. Furniture was chosen for its strength, curtains and carpets for their wearing qualities; houses were built without any respect for beauty.

William Morris saw that houses and furniture form what we call a man's "environment," and that a person is affected by his surroundings. If we live in a dingy room we find it hard to be cheerful. If we are always looking at ugly things our mind will sooner or later become either ugly or bitter.

How men's lives are made ugly by ugly surroundings

Long before Morris lived, men had seen that evil surroundings were bad, and the Church had always striven to rescue people from living with wicked persons in bad places. Morris did exactly the same work for beauty. He saw that ugly surroundings had a bad effect upon people, made them coarse, vulgar, stupid, even wicked. He set himself to teach the great lesson that beauty is something for which men should strive, because it is better than ugliness.

If we look in the windows of many furniture shops, we see that the chairs, and sideboards, and washstands all aim at being grand. In the poorest parts of any city we find these dreadful plush-covered chairs, these gaudy carpets and rugs, these "grand" wardrobes and washstands. Many people mistake grandeur for beauty. Morris set himself to fight this terrible idea. He succeeded largely; but the mass of men to this day remain dead to beauty. Morris not only made furniture, but he even designed wall-papers. He printed books on beautiful paper in a beautiful way. Everything in life, he felt, must be beautiful.

How William Morris struck a blow at vulgarity and ugliness

It was William Morris who first struck a blow at the vulgarity and tawdriness that grew up in the Victorian Era. It was he who first inspired modern England with a desire for simplicity and beauty. This was a great work. Beauty is part of life. We must seek beauty as well as goodness. In seeking beauty we seek God, for all that is of God is beautiful.

None of the men whose lives we have been studying found it easy to carry out their reforms, and Sir Rowland Hill, with whom our story closes, found his way no easier. He was born in 1795, at Kidderminster, the son of a teacher, and himself became a teacher. His work made him conscious of the hard lot of the poor, and he helped to found the excellent Society for the Diffusion of Useful Knowledge. That, however, was only the beginning of his work. At that time to send a letter from London to Brighton cost 15 cents, and from London to Aberdeen 30 cents. Poor people could not afford to receive letters.

The sort of thing that happened was discovered by the great poet Coleridge. He saw a postman hand a letter to a poor woman at a cottage in the Lake District and ask 25 cents. She looked at the letter, then gave it back to the postman, saying that she could not afford the money. The poet paid the postman, and gave the woman the letter.

After the postman had gone the woman told Coleridge that his kindness was wasted. She had an arrangement with her brother that if he were well he should send her a blank sheet once every three months. She, seeing it, would know that he was all right, and need not take the letter, only paying the postage if there were any written matter in the letter, which would mean that he was ill.

A poet's story that gave Rowland Hill the dream of the penny post

Hill, who heard the story, thought that a system which made brother and sister conspire to cheat was very dreadful, so he proposed that the postage for all letters in Great Britain should be 2 cents. The postmaster-general of the time said that the scheme was the wildest he had ever heard; and postal officials declared that it was bound to fail. Hill, however, continued to advocate the reform, and in 1840 it was carried. He was appointed to carry out the reform, but a year later another government came into power and dismissed him. In 1854 the former government returned to office, and he was reappointed, and carried out his splendid scheme completely. He organised the parcels post, too, and the money-order system. His reforms have done more good for the nation than anyone can estimate. Hill was made a knight and granted a pension of $10,000 a year, and he was also given $65,000 by his admirers and $100,000 by the government.

The next Men and Women begin on page 3737.

READING

WHAT AN ADVERB IS

CONTINUED FROM 3498

I THINK we have had enough of verbs, so we will leave them. And now I want to ask you a question. "Are you able to read a little for yourself by this time?" I hope each one of you can answer, "Yes, thank you. I can read NICELY!" At any rate we will suppose that each of you has given that answer. Now, look at that word printed in big letters, NICELY. You know another word something like it, don't you? NICE. There is not very much difference between the two, but you never use one where the other ought to be used. How silly it would be if you said, "Father has given me a NICELY book"; or, "This ball bounces NICE."

What is the difference between them? The word NICE tells us something about a thing. In the sentence "Father has given me a NICE book," it tells us something about the thing called a book, and therefore it is an adjective (look back at page 2649). But NICELY tells us how something happens or is done. "This ball bounces NICELY" tells us how the ball bounces. The word NICELY belongs to the verb "bounces," and so it is called "belonging to a verb," or an AD-VERB (the word AD is the Latin for TO).

So we get this rule, which we must not forget: Adjectives tell us something about nouns; Adverbs tell us something about verbs.

A great many adverbs are formed by adding the two letters LY to adjectives, in this way:

Adjective.	Adverb.
BAD	BADLY
GLAD	GLADLY
WISE	WISELY
GRAND	GRANDLY
AWFUL	AWFULLY
FINE	FINELY
RICH	RICHLY

And just one more, so that you can say you have learnt one of the longest words in the English language:

IN-STAN-TAN-E-OUS
IN-STAN-TAN-E-OUS-LY

If you can manage that last word, I think you can manage anything. Try to make some more up for yourselves.

But adverbs are not bound to end in LY. Any word that tells us something about a verb is an adverb. Look at these examples carefully:

The horse gallops FURIOUSLY.
The fire burns BRIGHTLY.
How do you feel? I feel very WELL.
David fought the giant BRAVELY.
Moses lay SAFELY in the ark of bulrushes.
We cheered the King HEARTILY.
Run QUICKLY, and you will SOON be THERE.
The shades of night were falling FAST.
Britons NEVER, NEVER shall be slaves.

If you will ask yourself the question "How, When, or Where" in connection will each of those sentences, you will see that the adverb gives the answer.

How does the horse gallop? FURIOUSLY.

When shall Britons be slaves? NEVER.

If you run quickly, where will you soon be? THERE.

Here are some "Adverb Verses" about a boy who has been seen by a farmer up one of his trees, stealing apples. You must imagine that the farmer is waiting at the foot of the tree for the boy to come down. Each line, you will find, ends with an adverb.

He looked at me so CURIOUSLY,
And said, "What do you HERE?"
But by and by he FURIOUSLY
Cried out, "Come down from THERE."
And when I smiled so PLACIDLY
And sat as calm as EVER,
He grunted, saying ACIDLY,
"Well, I'm not beaten, NEVER."
So I waited on COMPLACENTLY,
Though feeling rather ILL,
For the farmer (who ADJACENTLY
Was waiting, waiting STILL)
To go away INGLORIOUSLY;
But I'm still wondering HOW
To get away VICTORIOUSLY,
For here we are till NOW.

WRITING

TOM AND NORA WRITE THEIR LETTERS

WHEN the day came for writing to Cousin Jack, the children got out the almanac, and they found on counting the days the letters would take to go across the Atlantic, and right across America, they would reach Jack in time for his birthday.

"I have been looking at the letters you wrote to us, mother," said Nora, "and Tom and I have been thinking what to say in our letters, so that we can start now."

"That's right, Nora," said her mother; "that is sensible. There are so many girls and boys who try to write letters, and all the time keep asking: What shall I say? Now, what *shall* I say next? until all the letter has to be made up for them."

First Tom and Nora ruled three short lines in the right top corner of a sheet of notepaper, two for the address and one for the date. Then to the left, lower down, three-quarters of a line for "Dear Cousin Jack"; a short line to the right below that, across the rest of the page, to begin the letter on. After that they ruled lines at regular intervals till near the end of the fourth page. There they made three shorter lines, one for "I am," another for "Your loving cousin," and the third for their names.

They were very busy for the next twenty minutes, only stopping to ask their mother how to spell the long words. Tom's little hand began to ache, but he would not give up, and tried hard not to make a single blot or smudge. The letter that Nora wrote is on page 3709. This is the letter that Tom wrote:

3, Ferndale Avenue,
Upper Norwood, S.E.,
August 5, 1908.

DEAR JACK,

I am writing to wish you many happy returns of your birthday.

Father gave me a kite on my birthday. We are going to fly it on Saturday if there is a nice wind.

Can you write letters? We do hope you can write to us.

Your loving cousin,
TOM.

When the letters were finished, the children's mother showed them how to fold the paper neatly and evenly by doubling it up from the bottom to lie edge over edge, holding these down with the left hand while the right thumb made the crease in the middle. Then she gave them envelopes, and told them how to address them, writing first the name, then the name of the house, then the town, and then the country, in four lines going down like steps from left to right. They addressed the envelopes to Cousin Jack like this:

Master Jack Osborne,
32, Boston Avenue,
Marysville,
California, U.S.A.

Their mother said it was very important that the envelope should be clearly addressed, because if the name was badly written or the number of a house wrong, the postman would have a great deal of trouble to find the person for whom the letter was meant.

3 Ferndale Avenue.
Upper Norwood. S.E.
August 5. 1908

Dear Cousin Jack.

Mother has been showing us how to write, so Tom and I are sending you these letters.

We hope they will reach you in time to wish you many happy returns of the day.

Do you like California? It must be nice to pick oranges. They will not grow in our garden. Tom and I have gardens, and grow mignonette and sweet-peas.

When are you coming to England? We want to see you.

Do please write me a letter soon.

Your loving cousin
Nora

MORE ABOUT LONG DIVISION

In our last lesson we worked a simple example in "long" division. We shall now work another example in order to explain one or two little difficulties which may arise.

Divide 18113 by 59.

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59)18113(307
  177
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  413
  413
  ---
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As before, we first take as many figures of the dividend as will make a number bigger than the divisor. Here we require three figures, 181. Our first difficulty is to find "how many times it goes." If 181 had no figures following it, it would stand for eighteen tens and a unit. The point we have to notice is that it contains 18 tens. Our divisor contains 5 tens. Try, then, how many times 5 can be got from 18. Say, 5 into 18 goes 3.

On multiplying 59 by 3 we get 177, which is *a smaller number than* 181. We can therefore subtract the 177 from 181. Remainder, 4. This 4, from its position under the hundred's figure of the dividend, means 4 hundreds; but, as we have seen, this need cause no trouble: we can treat it as simply 4.

The next thing is to "bring down" the next figure, 1, of the dividend. This gives 41 (forty-one tens). Now comes our second difficulty. The number 41 is less than our divisor, 59. Still, there is not much difficulty after all; for it simply means that with only 41 tens at our disposal we cannot put a ten into each of 59 groups. That is, there are no tens in our answer. We must therefore *write* 0 *in the answer.*

Remember that *after bringing down a figure from the dividend we must always put a figure in the answer.*

Having put 0 in the answer, we bring down the next figure, 3, from the dividend, giving us 413. To find the figure for the answer, we remember that 413 contains 41 tens, and our divisor contains 5 tens. Five into 41 goes 8. Thus, 8 appears to be the figure for the answer. But if we multiply 59 by 8 we get 472, which is *bigger than* 413. Evidently, we cannot put as many as 8 things into the 59 groups. We try 7 instead. Seven times 59 make 413, so that 7 is the figure we want.

This last little difficulty shows us that when we have found what *appears* to be the figure for the answer we should always, before proceeding with our sum, multiply the divisor by this figure and see that the result is not too large. If it is, we must try the next smaller number. If still too large, the next smaller than that, until we get at the right one.

Finally, remember that *the remainder at any stage can never be as large as the divisor.* If we ever get such a result, it means that the figure we have just used in the answer is not large enough.

EXAMPLES. Divide:

1. 67961 by 31.
2. 36278 by 17.
3. 1257130 by 65.
4. 93744 by 93.
5. 1386641 by 47.
6. 4013753 by 79.

On page 3291 we saw how to take away 5 times 133 from 850 without making two "sums" of it—that is, we did not first do the multiplication of 133 by 5, and then subtract 665 from 850. We combined the two processes and obtained the result with less trouble. Now, by using the same method for our long division we shall shorten our work very much: we shall have fewer figures to write, and less work to do mentally. It is therefore very well worth our while to learn this shorter method. After a very few examples, the process becomes quite as simple to us as the method shown on page 3493. In fact, this was done for the sake of explanation of division, and now that we do understand division, it will certainly be wise to use a method which gives so much less labour.

Divide 80172 by 34.

```
34)80172(2358
  ---
  121
  ---
  197
  ---
  272
  ===
```

As before, take as many figures as make a bigger number than 34—that is, take the first two. Draw a line under them. We see that the first figure of the answer is 2. We have therefore to multiply 34 by 2 and take the result from 80. To do this in one operation, we say, as on page 3291:

Twice 4, 8, and 2 make 10. (Put down 2, carry 1.)

Twice 3, 6, and 1, 7, and 1 make 8. (Put down 1.)

Bring down the next figure, 1. By trial, we find that 34 into 121 will go 3. To take away 3 times 34 from 121, we say:

Three 4's, 12, and **9** make 21. (Put down 9, carry 2.)

Three 3's, 9, and 2, 11, and **1** make 12. (Put down 1.)

Bring down 7. 34 into 197 goes 5. Say:

Five 4's, 20, and **7** make 27. (Put down 7, carry 2.)

Five 3's, 15, and 2, 17, and **2** make 19. (Put down 2.)

Bring down 2. 34 into 272 goes 8. Say:

Eight 4's, 32, and **0** make 32. (Carry 3.)

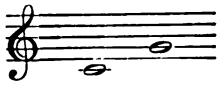
Eight 3's, 24, and 3, 27.

In our next lesson, in which we shall learn more about division, we shall always use this shorter method for working out our examples.

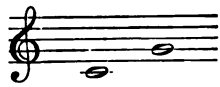
MUSIC

THE SPACES BETWEEN THE NOTES

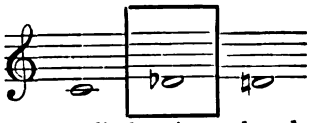
Now we are going to think of the notes contained in our little exercise. We want to see what the fairies are doing, for they never want us to play without thinking. If they are to give us their best, we must give them all our thoughts. Whenever we begin to learn a little piece, or even a finger exercise, we must see how it is made, how it is built. This little exercise, which we have named "The Fairies' Drill," is really a musical walk from C to G.



Fairy C's central home is the starting-point, and Fairy G's home on the second line is the landmark which must be reached, and the turning-point on the return journey to our starting-point, C. Therefore, the two notes to really think about are C and G.

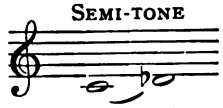


We will first look at the little steps we have to take between these two notes. C and D are not quite close together, for a little goblin lives between them—Fairy D's kind friend D flat.



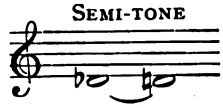
That funny little sign placed before Fairy D's house ♮ is called a *natural*. It is the fairy's way of saying, "Thank you, kind goblin, for singing for me. Now I am at home again, and able to answer the door for myself." This being so, we press Fairy D's note, instead of going to the little goblin's house. From C to D flat is a very small step, so small the fairies call it a *semi-tone*, or half a tone. They like the word tone much better than step.

SEMI-TONE



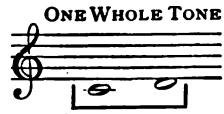
From D flat to D is another semi-tone,

SEMI-TONE



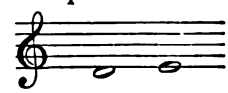
and as two halves make one whole, two semi or half tones must make one whole tone. Therefore, from C to D we have one big step—one whole tone—because, though we do not have to play D flat in "The Fairies' Drill," the fact remains that his house is there, and we thus get two semi-tones between C and D.

ONE WHOLE TONE

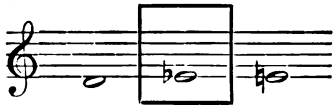


Now we will play those two notes, first C, then D, and listen very carefully, after which we will sing them. This step of two semi-tones is called a *major second*, because, first, it contains two letters, following one another as they do in the alphabet, C and D; and, second, it also contains two semi-tones. There is a third reason, but we will hear about that a little later on. Major means greater, and there is a smaller second, called a *minor* or lesser *second*, to which we shall soon come.

The next step is D to E.



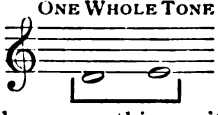
If we really listen we shall hear that there is just the same distance between these two notes as between C and D. So we have another major second, because it contains two letters, D, E, and two semi-tones.



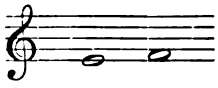
From D to E flat is one semi-tone, from E flat to E is another semi-tone; therefore the two rules are kept—(1) two letters, (2) two semi-tones.

So again we have a major second to play and sing.

ONE WHOLE TONE



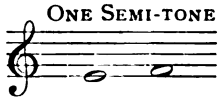
See, we have something quite different now!



Fairy E and Fairy F live quite close together, no little goblin comes between them, so there is only one little step—one semi-tone between E and F. It makes a great difference when we have one semi-tone instead of two. We will play them very carefully, and listen. The distance from E to F seems much smaller than from C to D, or from D to E, does it not? There is the difference of one semi-tone; we have one semi-tone instead of two, so we call it a minor second—that is, a lesser, a smaller second, for minor is one little step less than major. We still keep two letters, E, F, therefore a minor second has two letters following one another, just as they do in the alphabet, and it contains only one semi-tone.

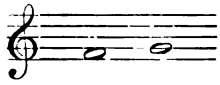
Now, once more we will play this:

ONE SEMI-TONE

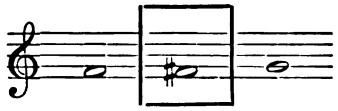


Listen very carefully, and sing it.

We next have to think about F and G.



We see quite easily by this time that F to G is a major second, for it contains two letters succeeding one another in alphabetical order; it also contains two semi-tones. Little Goblin F sharp comes between F and G



so F to F sharp is one semi-tone. F sharp to G is another semi-tone, therefore the second F to G has two letters, and two semi-tones, and has consequently every right to its title, "a major second."

DRAWING

THE WAY TO DRAW A DOOR

As a door is a difficult thing to draw, we will sketch it first in charcoal, on white or brown paper, or we can use white chalk and a blackboard, if we have one. The best plan of all is to go out of doors and find a very plain garden door, from which we can sit a good distance away and yet see it well.

We will sit exactly opposite the framework and open the door about one-third for our first drawing; and we will begin by getting the right proportion of the doorway, or framework, first. We learned how to find the proportion of things by holding the pencil at arm's length some time ago in our drawing lessons, and we must use this way now to see how many times the width of the doorway is less than its height. When this is done we must see where the eye-level is.

The drawings on the next page will help you to find your eye-level, perhaps, but they will not show you exactly where yours will be on your own drawing. Grown-ups and children do not ever see things exactly the same.

If the door opens out towards us, as it does in a room, the side of the door where the handle is will be the longest side of all, because it is nearer than the other side.

It will *look* higher than the framework and lower, too, though we know it must be even a little smaller, or the door would not shut.

It seems strange that we see things quite differently from what they really are, but it is very interesting and pretty to see things getting smaller or larger as we move nearer or further from them. Can you imagine big ships looking quite as large out on the horizon as they do when we see them in the docks?

We can find out how much of the door must be drawn above the framework, and how much below, by using the pencil at arm's length to measure with. We must make all our measurements this way now, to correct our drawings, but we must always remember that we do not measure for the size of the things, but only to see how much bigger or smaller one part is than another. The lines above the eye-level slant downwards. If the eye-level is not in the middle of the doorway the lines will not slant equally.

If the eye-level is above the middle of the door, which will slant most—the top of the door, or the bottom?

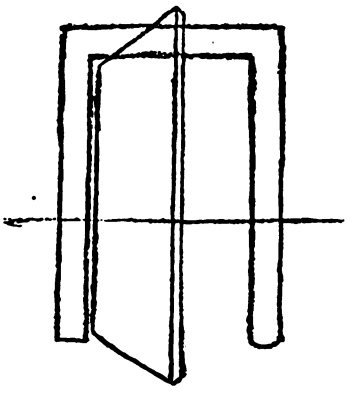
If the door opens outwards, away from us, the side where the handle is will be the shorter, and the thickness of the wood of which the door is made will show near the hinges instead of near the handle.

When we have made charcoal sketches enough to feel we understand how to draw the door, we can try to do it in pencil.

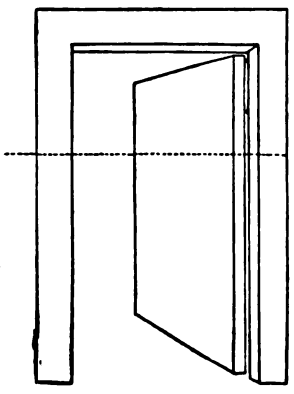
In charcoal drawing we must not use indiarubber. A clean piece of rag used to dust off the wrong parts is best; but the paper must not be rubbed. It is sometimes enough to blow lightly on the wrong part or to tap the paper underneath. We must buy some stuff called "Fixitif" if we make charcoal drawings good enough to keep; it is blown on to the paper through a little tube, and we must draw on "charcoal" paper. We ask for "Michalet" paper at the shop.

Or, if we like it better, we can use a paper called "Charpas," which has only to be held near the steam of a kettle, and any drawing made upon it in charcoal or chalk is fixed so that it cannot be rubbed off.

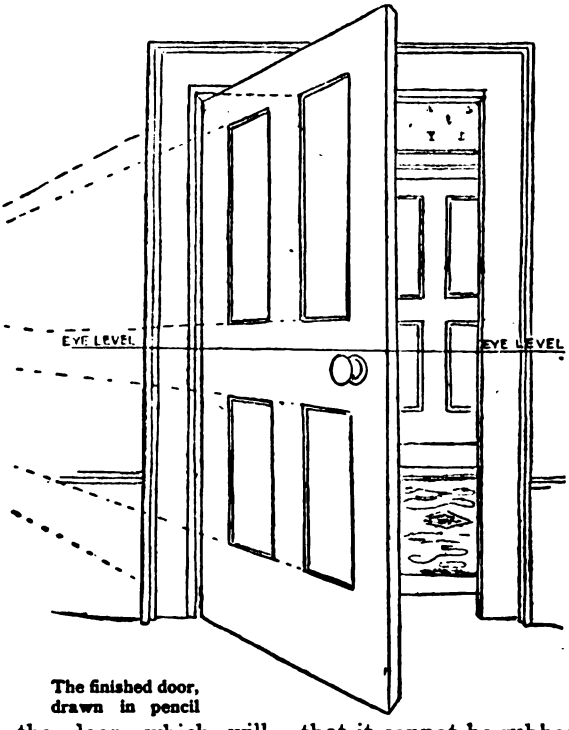
If our door looks well we will try to put something else into the sketch to make a picture—a man or a woman coming through it, or something easy like a bucket or a watering-can, or flower-pots near the door-post.



Door opening inwards, in charcoal



Door opening outwards, in pen & ink



The finished door, drawn in pencil

LITTLE PICTURE-STORIES IN FRENCH

First line: French. Second line: English words. Third line: As we say it in English.

Un jour Maman nous fait venir et dit : "Nous allons demeurer un an à Paris."
One day Mamma us makes to come and says : "We go to dwell a year at Paris."
One day Mamma calls us, and says : "We are going to live in Paris for a year."

"Pourquoi ?" dit Jeannette. "Papa a des affaires ici. Etes-vous contente ?"
"Why ?" says Jenny. "Papa has some business here. Are you content ?"
"Why ?" says Jenny. "Papa has business here. Are you pleased ?"

"Oui. Nous n'aurons pas de leçons." "Mais oui ! Une institutrice viendra."
"Yes. We (not) shall have not any lessons." "But yes ! An instructress will come."
"Yes. We shall have no lessons." "Oh, yes, you will ! A governess is coming."



"Comment s' appelle-t-elle ? Est-elle Anglaise ?" "Mdlle. Loué est Française."
"How herself calls she ? Is she English ?" "Miss Loué is French."
"What is her name ? Is she English ?" "Mademoiselle Loué is French."

"L'aimerons nous ?" "Oui ; elle vous enseignera beaucoup de nouveaux jeux."
"Her shall like we ?" "Yes ; she you will teach many of new games."
"Shall we like her ?" "Yes ; she will teach you lots of new games."

A trois heures nous allons à la gare. Nous cherchons Mademoiselle.
At three hours we go to the station. We search for Miss.
At three o'clock we go to the station. We look out for Mademoiselle.

Enfin Maman dit : "Venez, mes enfants ! Voici Mademoiselle !"
At last Mamma says : "Come, my children ! Here is Miss."
At last Mamma says : "Come, children ! Here is Mademoiselle !"

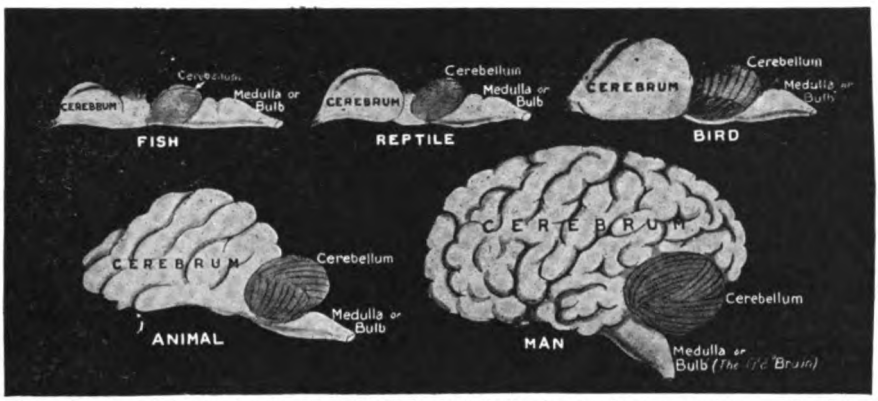


Maman dit : "Louis portera votre paquet." "Permettez-moi," dis-je.
Mamma says : "Louis will carry your parcel." "Permit me," say I.
Mamma says : "Louis will carry your parcel." "Allow me," I say.

Dans le paquet il y a une poupée pour Jeannette et une boîte à outils.
In the parcel it there has a doll for Jenny and a box of tools.
In the parcel there is a doll for Jenny and a box of tools.

"Vous êtes très bonne," crions-nous. J'aime Mademoiselle beaucoup beaucoup.
"You are very good," cry we. I love Miss much much.
"You are very kind," we cry. I like Mademoiselle very much indeed.

THE NEXT SCHOOL LESSONS BEGIN ON PAGE 3781



These diagrams enable us to compare a man's brain with the brains of other creatures. The size of each is drawn in proportion to the size of the creature's body, and we see that man's brain is very large.

THE MYSTERY OF THE BRAIN

CONTINUED FROM 3555

WE now know that, in ourselves, the highest and most important part of the nervous system is what may be called the new brain. The picture on page 3712 shows what it looks like when viewed from above, and the first thing we notice is that there is nothing else to be seen but the new brain. It is so large, and has grown out so far in all directions, that the whole of the older part of the nervous system is hidden underneath it. In an ordinary way, when we talk about a man's brain or brains, it is entirely of this new brain that we are thinking. The proper name for it is cerebrum. The word cerebellum, which we already know, really means little brain.

Now, our first glance at the cerebrum shows us that it is a double organ. It has a right half and a left half. These two are just like each other, though it is probable that in right-handed people the left half, and in left-handed people the right half, is very slightly larger. We have therefore, in a sense, two brains, just as we have two arms; for our bodies are built upon the principle of there being two halves corresponding to each other. If we slightly separate the two halves of the cerebrum, and look down between them, we see a mass of white nervous tissue which is evidently running across from one side to the other. This is a great bridge between the two halves of the brain, by which they are made to work and act as one. When we look at the surface of the brain, we see at once that it is very much folded; all over it the surface has been turned inwards into deep valleys. These vary in depth and length, but on the whole they form a very definite pattern, which is the same on both sides of the brain, and the main lines of which are the same in all human beings. All the folds and the spaces between them have special names.

First let us understand what the folding means at all. The use of it is that it permits what is really the surface of the brain to be enormously increased, without requiring it to take up more room. Now the surface of the brain, as we shall see, is the all-important part. Brains have been growing bigger in the animal world generally for countless ages past. This means that there has been a great deal more room required to house the brain in, and so skulls have been getting larger. The size of the skull of man, compared with the size

of his whole body, is simply gigantic. But though this is so, it very feebly indicates what the huge growth of man's brain has been, simply because the brain has grown far more quickly than the skull, as life has ascended, and has deeply tucked in its surface, here and there, as it went on growing, until there is now as much, or perhaps considerably more, of the surface of the brain tucked away than shows on the outside. In general, the higher the type of brain, the more is its surface folded. We can show this whether we trace the brain upward in different kinds of animals, or whether we compare different human brains with one another. As animals have become more and more clever, and have trusted more and more to brain and skill, rather than to size and strength, the surface of the brain has become more folded, and people who study the subject can tell in a moment, by looking at the surface of the brain alone, whether it belongs to one of the older kinds of animals or to one of the cleverer animals that have more lately appeared on the earth.

THE MANY FOLDS IN THE BRAINS OF VERY CLEVER MEN

A great many brains of famous men have been examined; many great men, indeed, have left orders that their brains should be examined for the advance of knowledge. As a general rule, these brains are found to be very highly folded. The contrast is very great between them and the brains of, say, such a humble type of mankind as the Bushman of South Africa. Of course, this means that if we could unfold all the brains in question, and stretch out their surfaces quite flat, the cleverer brains would be the brains with the biggest surfaces.

The size of the skull, its shape and the bumps on it, can tell us absolutely nothing whatever as to how much the brain is folded; still less as to what we shall find when we examine more closely what the foldings are made of. There is, on the whole, and in a very rough way, some correspondence between the size of the skull and the size of the brain inside it. But, for one thing, skulls vary in thickness; and, for another, no one can possibly tell what it is that is making up the size of the brain. Even if all skulls were the same thickness, and even if bumps corresponded to the brain, which they never do, the brain inside might be large because certain spaces inside it were swollen with fluid, or it might be large but have a comparatively smooth surface. It is quite easy to understand that a well-packed brain, which will go into a much smaller skull than another, may yet, if unfolded, turn out to have a far greater surface.

WHY THE SKULL CAN TELL US NOTHING ABOUT THE BRAIN

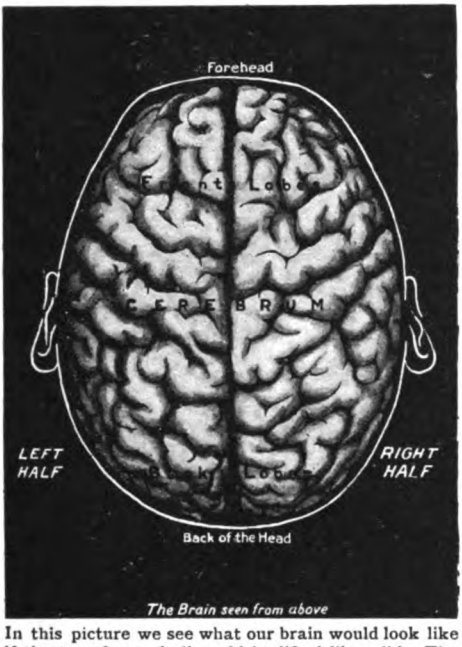
About a hundred years ago, when practically nothing was known about the brain, men thought that, by feeling and measuring the skull, they could learn about the brain, and so tell the character of the person to whom it belonged. Our modern knowledge of the brain has taught us that it is hopeless to expect this, simply because the things that really matter do not affect the skull at all. If a very large and dangerous surgical operation were performed, so that a considerable portion of the brain were exposed and could be seen, then we might, perhaps, make a very rough guess as to what the person was like; but as we should have to judge how far we were right entirely by what we knew of the person in the ordinary way, it is difficult to see where the advantage of such an operation would come in.

Now, we must understand why it is that the surface of the brain matters so much. Directly we cut through the cerebrum of any of the higher animals, we find at once that it consists of an outside layer, which is grey in colour, and an inside layer, which is white. This grey layer, which covers the entire brain, always dips down and up again wherever the brain is folded. There would be no meaning in the folds if it did not. It is often called the *mantle*, that is, something which is stretched all over the outside of the cerebrum.

THE REAL BRAIN OF MAN THAT IS THE MOST WONDERFUL THING WE KNOW

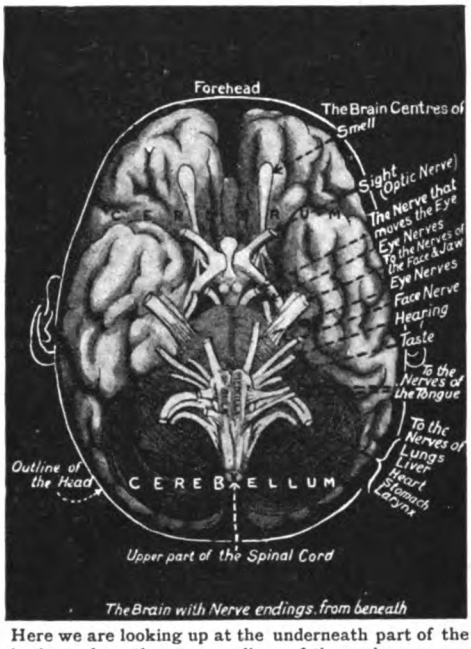
At no part whatever of either half of the brain, whether we look at the part it rests upon or in the depths of any of the folds, do we find this wonderful mantle lacking. It is the real brain, and, as we find it in mankind, it is the most wonderful thing of which we have any knowledge. It owes its grey colour, and all its meaning and wonder, to the fact that

THE INSIDE AND OUTSIDE OF OUR BRAINS



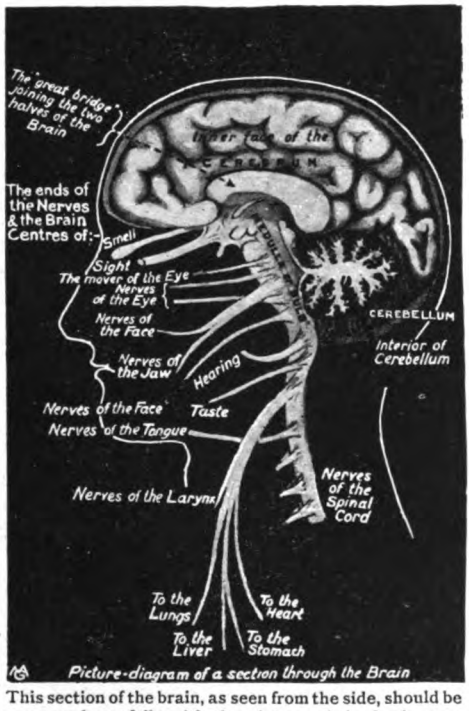
The Brain seen from above

In this picture we see what our brain would look like if the top of our skull could be lifted like a lid. The cerebrum, or new brain, is the part by which we reason out things, and it completely covers the cerebellum.



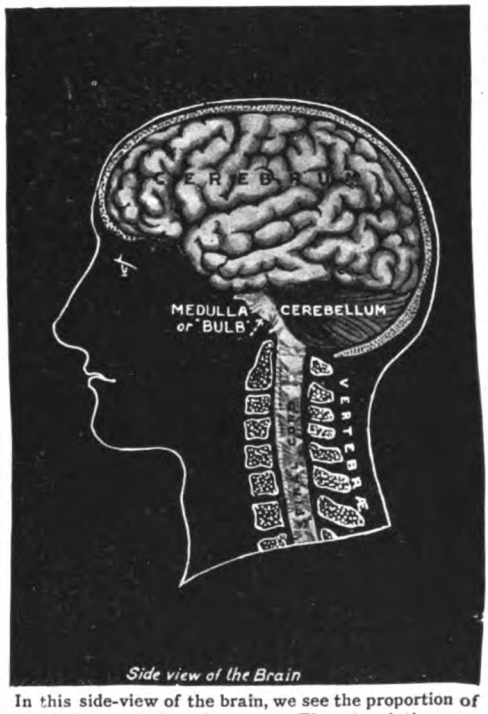
The Brain with Nerve endings from beneath

Here we are looking up at the underneath part of the brain, and see the nerve-endings of the various senses and of the vital organs, all cut off short, except the nerve of smell, which is shown ending in a bulb.



Picture-diagram of a section through the Brain

This section of the brain, as seen from the side, should be compared carefully with the picture of the brain seen from underneath. In both pictures, the nerves are shown in the order in which they leave the bulb, or old brain.



Side view of the Brain

In this side-view of the brain, we see the proportion of the skull occupied by the brain. The convolutions, or folds, are shown, and the position of the brain in relation to the spinal cord and the backbone is easily seen.

it is mainly made up, not of nerve-fibres, but of nerve-cells. The rest of the brain is made up of nerve-fibres or nerves, and these give it a white appearance, like that of an ordinary nerve in the arm or the leg; but the grey mantle contains only comparatively few nerve fibres, which connect its different parts in some degree.

How the Real Brain is Made Up of Thousands of Millions of Cells

What really makes up the grey mantle is thousands of millions of nerve-cells. These nerve-cells are vastly more wonderful even than those we find in the spinal cord, or those which live in the bulb and control our breathing, for they have to do with thinking, not to mention seeing and hearing, and so on.

Only a very few years ago, it used simply to be taught that when we take a very thin layer of this grey mantle, and look at it under the microscope, we see five layers of cells in it; one on the very surface of the brain, and so on, until the fifth lies next the white matter inside the brain. We can recognise these five layers because the cells in the different layers differ rather from one another in their size and shape and number. But now we can go much farther than that. It is, in general, true that we find about five layers of cells in any part of the grey mantle that we care to examine, but we also find that the cells differ very definitely in different parts of the brain. Also, if we carefully examine corresponding parts of the brain in large numbers of animals of quite different kinds, we find that the same arrangement of cells occurs in corresponding places.

The Likeness Between the Brain of a Man and the Brain of an Animal

If we showed a man who had studied the subject a microscope slide containing a large number of cells shaped like pyramids and arranged in a certain way, he very likely could not be sure what animal the brain had belonged to, but he could say in a moment that that was the part of the brain which the animal used when it wished to move its muscles.

Again, if he saw certain curious little groups of cells lying not very far from the surface of the brain, he would say, without hesitation, "that comes from the part of the brain the animal smelt with." No one has the least idea yet what this particular group of nerve-cells has to do with smelling, but we always find them in the smell part of the brain, and nowhere else. This is equally true of creatures like the dog, in whom the smell part of the brain is large, and of creatures like ourselves, in whom the smell part of the brain is comparatively quite tiny.

The parts of the brain which have to do with sight and with hearing are just as definite in their structure, so that it is vastly easier to tell that we are looking at something taken from the vision part of the brain than to tell what animal it was taken from.

The whole of the surface of the brain has been mapped out now very completely. On page 3712 we see a picture of one side of the human brain, showing different parts which we know have special duties.

Why a Man's Brain is Better than an Animal's

Now, when we have carefully learnt to map out the various brain centres, as they are called, for the motion of muscles, for feeling from the skin, for sight, hearing, taste, and smell, we find that still the *greater part* of the whole surface of the brain is actually untouched. It is almost as if the greater part of the surface of the brain had no duties. We cannot find that it has anything to do with any of the duties that we can think of.

Now, when we begin to examine the brains of other animals, it soon becomes possible to take, shall we say, twenty different brains, and arrange them in an ascending order, beginning with the brain of some simpler kind of animal, as, for instance, a rabbit, and ending with the brain of man. If we do this we find a very wonderful thing. It is that the lower we go down, the nearer together in the brain are the different special centres which we have already found in the brain of man.

Indeed, when we go low enough, the whole brain practically consists of these various centres—for motion, and seeing, and so on—all lying right up next to each other. They make the brain. But to look at it the other way, as brains improve and get bigger, what happens is, not that these various centres get

bigger, but that they become gradually separated from each other by the growth of new parts of the brain which appear and come to lie between the old centres. This process goes on and on, until at last in mankind, and only in mankind, it has reached the stage at which the various special centres, which long ago lay all together and *were* the brain, have become mere patches that lie here and there on the surface of man's huge brain.

What, then, is the meaning and the duty of these great new places that have come into existence, and to which the growth in the size of the brain is really due? When we question them, they are, so to speak, silent; indeed, they have been called the silent areas. We shall surely get some help in our studies if we can trace the course of the nerve-fibres that run out from the nerve-cells in these particular areas.

THE WONDERFUL FIBRES THAT LINK ALL OUR SENSES TOGETHER

As regards the special centres, we find that the fibres from the cells in them run just where we should expect. The fibres from the seeing centre run straight to the eye, the fibres from the hearing centre are connected with the ear, the fibres from the centre for movement run down into the spinal cord and are connected with the nerves that go to the muscles. These facts, of course, help to give us the key to the duties of these centres. If, now, we can find where the nerves run to from the silent areas, we shall guess what these areas really do, and it must be something very important indeed, because, whatever it is, it seems to explain the real difference between clever animals and stupid ones, high ones and low ones.

We find, then, that these fibres from the silent areas run in every possible direction, but in very definite groups and ways, to the other centres of the brain. What they do is to *associate* one part of the brain with another. I think we can understand that if there were no such things, then, though an animal might see very well, nothing that it saw would connect itself in that animal's mind with anything that it had heard, or felt, or smelt. Now, when we come to study the way in which we act, the way in which we put two and two together; when we notice how one thing makes us think of another thing, we begin to understand how it is that the *association fibres* make all the difference in the world between a high brain and a low one.

WHERE A MAN'S BRAIN DIFFERS FROM THE BRAIN OF A DOG

If we compare the spinal cord or the bulb of a dog with that of a man, there is nothing worth mentioning to choose between them. If we compare the new brain of a dog with that of a man, we find a difference, but it is one which mainly consists in association fibres and cells. If we compare the vision centre of a dog with that of a man, we find the two in the same part of the brain in each case, and with the same special type of cells.

The difference, however, is that the grey mantle in the case of man is much thicker; and when we come to inquire into what makes it thicker, we find that it contains a vastly greater number of fibres, which are running to it from other parts of the brain, and of new cells, which have nothing to do with seeing itself, but which send fibres out from the seeing centre to all the other parts of the brain. In general, then, we may say that the differences between a high brain and a low brain are, first, that in the various special centres the grey mantle is much thicker in the high brain, because it is crammed with new association cells; and, second, that in the high brain the special centres are forced apart by the growth in between them of new parts of the brain, which do not mean the invention of any new kinds of senses, but mean bringing all the parts of the brain into closer relation and connection with one another.

SOME OF OUR SENSES THAT ARE MORE NOBLE THAN OTHERS

There are one or two very interesting exceptions to this rule, and they have a meaning. It must have struck all of us, if we ever think of our senses, that some of them are more noble than others. We agree—do we not?—that it is a more dignified thing to enjoy a picture than to enjoy a chocolate. Someone may say: "Well, in either case, we are simply using one of our senses; why is not one as good as another?" But when we suppose that vision and hearing are more noble than taste and smell, we are quite right,

and the reason is that they are more human. They reach a higher development in us than in any other creature, while so far as concerns smell, about which a great deal has been learnt, it is probable that our brains are far inferior to those of almost any other creature that has a brain at all.

THE SENSE OF SMELL, THAT IS WEAK IN MAN AND STRONG IN ANIMALS

If we study the smell part of the brain in different kinds of animals, we find that smell reached its perfection ages ago, when vision and hearing scarcely existed. But such a sense as vision is far finer than smell, because not only does it act at very great distances, but it gives us a thousand times more information that smell can possibly give.

Therefore, part of the history of progress in the world of life has been that sight has improved and has largely taken the place of smell. This is most marked in ourselves. The dog is a very high kind of animal, and belongs to an order which ranks next to the monkeys themselves, and we all know how splendid the dog's scent may be. But in our own brains the part which corresponds to smell has shrunk to almost nothing; it is, indeed, so small that it took a very long time to find where it was; while the vision part of the brain has become huge.

The great growth of the back of the cerebrum in man is due to the importance of vision to him, for it is the extreme back part of the cerebrum, on both sides, that we see with. Our real eyes are at the back of our heads. We have already learnt that the cerebellum is very large in us; but even though this is so, the vision part of the cerebrum has grown so enormously that the cerebellum is completely hidden from our sight by the cerebrum, when we look down upon the brain from above.

THE DIFFERENCE BETWEEN ONE KIND OF SENSE AND ANOTHER

It might be supposed that there is something wrong here, because many animals, such as birds of prey, have far keener sight than man has. That, indeed, is so; but are we right in supposing that the mere keenness of a sense is the highest thing about it? Not at all. The point is the extent to which we can use the information that the sense gives us, and the way it is linked up with every other part of our minds. The vulture can see a speck on the desert sand at a tremendous distance, but will the vulture enjoy a noble picture, or feel itself made humble and pure before a sunset? Of course, when we ask questions like this, we see at once what it is that really makes a sense high. No known animal has in the vision centre of its brain anything like the depth and variety of structure that we have in ours. This is the great fact for us to remember about the place where the seeing is really done.

We have seen that smell and taste are comparatively unimportant in man, and in both cases there was long argument, and much work had to be done, before we could be sure in what part of the brain these two senses really lived, so to speak. It might be supposed that the sense of touch would not be greatly developed in man, and that perhaps it is rather falling into the background, like smell and taste. This is a very great error, however. The most intelligent of all birds is the parrot. We notice this not only in its power of imitating sounds, but in many other ways.

WHY THE SENSE OF TOUCH IS CALLED THE MOTHER OF ALL THE SENSES

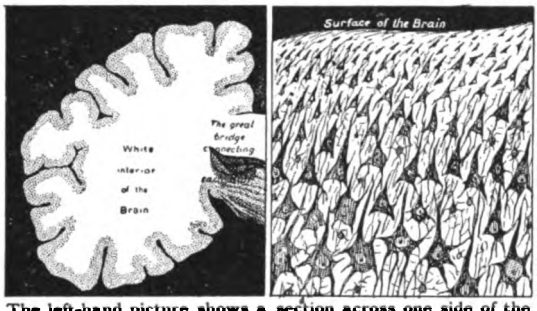
Now, it is an interesting fact that the parrot has a far more delicate sense of touch than any other bird. It really has quite a good notion of using its claws as fingers. It has the idea of stroking and feeling what a thing is like, as we say. Now, it is not just a chance that the most intelligent bird is the bird with the best sense of touch. It is what we should expect. The sense of touch is the mother of all the senses, in a way, and good education of the sense of touch is the foundation of all good education.

Probably some of those who read this will disbelieve it, but all the great students of the mind know that it is perfectly true, and have been saying so for scores of years. We are slowly learning to understand what games mean for children, because they train the sense of touch, and teach it how to work with sight; and, also, we are beginning to learn that drawing and carpentry, and the sort of things that children do in kindergarten, are invaluable foundations of education. There was a time

when it was thought that anything good for a child must be something that it disliked, and that anything it liked must be mere amusement. Who would think that the real meaning of the word school is *leisure*—doing what we feel inclined to do? Yet so it is.

Now, there is nothing we notice more positively about an intelligent child, and any child is intelligent until foolish grown-up people begin to interfere with its mind, than that it loves using its fingers. Of course it gets into mischief, but the child that never got into mischief, and never touched things it ought not to have touched, was never yet taught to read. There are such children, but they can be taught nothing, and we call them *imbecile*.

Whatever happens, the healthy child must constantly use its sense of touch; it must for ever be fingering things. Now, we find that the touch part of man's brain is simply magnificent. It is the delicacy and the variety of his sense of touch, and, far more than that, it is the marvellous way in which man's sense of touch is connected with all his other senses, that accounts for our skill, which is almost the most wonderful thing about us as compared with any other creature. Not in a thousand years could any other creature but man be taught, for instance, to read with the fingers, even if that creature had a brain that could understand.



The left-hand picture shows a section across one side of the brain, and we see by the shaded border the thickness of the grey matter of the brain, as compared with the white nerve-fibres. On the right is a tiny speck of the grey matter, magnified a hundred times, showing the pyramid-like cells and the fibres.

THE GREAT BRAIN PUZZLE THAT BAFFLED MEN FOR YEARS

For a long time it was a great puzzle to find the touch centre in man's brain. It lay, so to speak, under our very eyes; but we never thought of looking for it there. A very large area of the grey mantle on each side of the brain is the centre for voluntary movement, and it is here that the will of man gives its orders. For many years we knew this, and called it the motor centre; and when we were looking for the centre of the touch sense we never thought of looking there. But now we have found that the centre for will and movement is the centre for touch. The two lie mixed up together, and the connection between them is the closest of all connections in the nervous system.

THE WONDERFUL NERVES OF HEARING, THAT ENABLE US TO ENJOY MUSIC

The sense of hearing lives low down on the side of the brain, as we see in the pictures on page 3712. As we all know, this sense of hearing has led to the possibility of music and all that that means. As in the case of seeing, of course there must be good machinery outside the brain if a sense is to develop, and the history of hearing, like the history of vision, is partly the history of the ear and the history of the eye. Here, however, we must merely learn that the hearing centre of the brain is very large in mankind, and that when we examine the cells contained in it we find a state of things that exactly compares with what we found in the case of vision. It may be that some animals can hear sounds so slight that we cannot hear them. That, as we have learnt in the case of the eye and seeing, is not the test. No animal knows the difference between good music and bad; much less could any animal create a piece of music, even bad music.

Thus, this part of the grey mantle of the human brain is thicker than in any other creature, and, as we should expect, is very rich in association cells and fibres, that connect it with all the other parts of the brain. It seems, also, that there is a special part of the hearing centre, lying rather towards the front, which is concerned with music as distinguished from ordinary sounds; and though we do not know very much about this yet, it may be the case that this music centre is only found on the left side of the brain in right-handed persons, and on the right side of the brain in left-handed persons.

The next part of this is on page 3775.

HOW TO SPEAK BY SIGNS

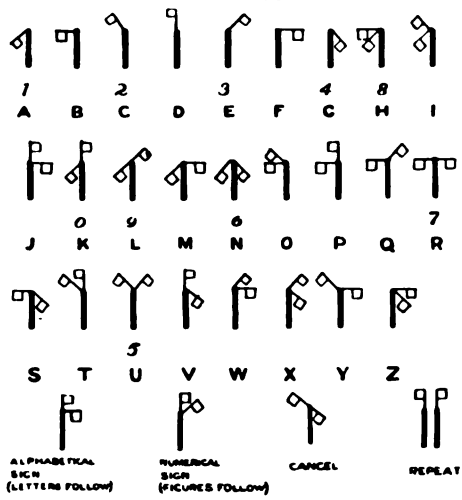
CONTINUED FROM 3616

THE military method of semaphore signalling, or "flag-wagging," as it is sometimes called, is a splendid way to exchange messages with those who are far beyond shouting distance, but still in sight—as on the golf-links, across a lake or river, or a long stretch of seashore. A semaphore message will carry as far as the signaller and the person to whom he or she is signalling are within sight of one another, while the apparatus for signalling is simplicity itself, a couple of semaphoring flags being readily manufactured in a few seconds from two white pocket-handkerchiefs, which may then be pinned on to a couple of sticks cut from the nearest hedgerow, or on to any couple of odd bits of driftwood found lying about.

For instance, if we are having a picnic on the beach, and the boys have wandered off while the girls prepare tea, it may be convenient to recall the former, and for this purpose no message is more effectual than that shown by the second, third, and fourth row of pictures opposite, which spell the words "Tea is ready."

Practice on paper might alternate with practice out of doors across a lawn, until the letters come almost mechanically, and after a day or two's practice it will be found possible to send long messages at a fairly even rate of speed.

It is an excellent plan to practise sending messages before a long looking-glass, as we learn in this way to send and to *read* a message at the same time. It otherwise takes much longer to learn to *read* signals sent by semaphore than to send them.



LETTERS AND SIGNS OF THE FLAG ALPHABET

The letters of the semaphore alphabet are shown in the picture on this page. Imagine the thick lines to represent the body of the person signalling, and the thin lines to represent the flags held in the hands. The letter A is represented by holding the right-hand flag as if it were pointing midway between the VII and VIII of a clock-dial, assuming the feet of the signaller to be at VI and his head to be at XII. If we look at the picture of the signal A in the message on the page opposite, it will be clear. It is good practice to write the alphabet signals on a piece of paper, beginning by writing out the entire alphabet a few times, and then by writing different letters at random, without consulting the alphabet, thereby testing our memory. Then we can write words, and thus send letters to our friends who understand the system of flag-signalling.

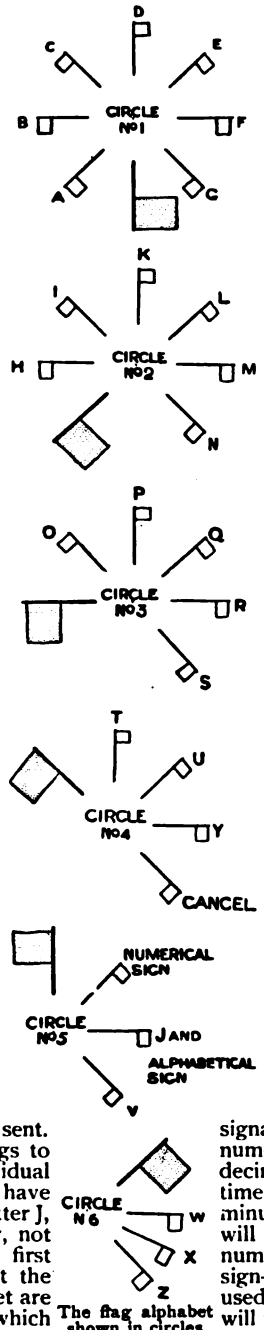
Another way to assist our memory is to study certain circles of flags. Looking at circle No. 1, seen on next page, we see that A, B, C, D, E, F, and G are signalled by letting the flag in the left hand hang down in front and by changing the position of the right-hand flag. From circle 2, on next page, it will be seen that the letters H, I, K, L, M, and N are made by holding the right-hand flag in the position of A, and by moving the left-hand flag to the positions placed opposite the letters. Then the third circle, which illustrates the letters O, P, Q, R, and S, shows the right-hand flag at the B position, and the left-hand flag moved round as indicated. If we look at the letter R, as shown in our "Tea is

ready" message, it is made plain to us. The fourth circle shows the letters T, U, Y, and the sign for "cancel," all of which are made by keeping the right-hand flag in the C position and changing only the position of the left-hand flag. We can compare this circle with the photograph of the letter T, as shown on the photograph page. Circle No. 5 shows the right-hand flag in the D position, where it is held when indicating the numerical sign, and also for J, or the alphabetical sign, and for V, the position of only the left-hand flag being changed for these different signs. Finally, the sixth circle shows that the letters W, X, and Z are indicated by holding the right-hand flag in the E position and changing the position of the left-hand flag only.

Probably the meaning of the words "alphabetical sign" and "numerical sign" is not clear, and we shall have it explained. There are no special signals for the numerals, A standing for 1, and other letter signs for other numerals, as seen in the picture on the preceding page. But in beginning a message, if it is to consist of letters, we make the signal for alphabetical sign first, thereby showing that the signs that follow are to be read as letters—A, B, C, and so on. Similarly, if, at the beginning, or in the course of a message, we wish the signs that are going to be made to be read as numerals, and not as letters, we make the numerical signal. The "annul" or "cancel" sign almost explains itself. It means that we wish the previous sign sent to be cancelled, perhaps because we find that we have made a mistake in transmitting.

Having seen the meaning of the various signs, we can proceed to see how a message is sent. To begin, we must stand in the position shown in the first picture on the photograph page, with the two flags slightly crossed over one another, facing the direction in which the message is to be sent.

We must next move both flags to attract the attention of the individual to be signalled to, and when we have succeeded, we must signal the letter J, which shows that letters follow, not figures, before returning to the first position. It has been seen that the letters of the semaphore alphabet are formed by the various angles at which the flags are held to the body, and, to send a message, we must stretch out the arms to their full extent, and hold the flags in a straight line with the arms, never allowing them to droop from the hands, and never inclining them to the rear. We may, however, turn on the hips, if we are about to form any letter which can be made more easily and seen more distinctly from a distance by doing so. We must be careful, when actually signalling, not to make the positions for the letters A and G too close to the body; and we must also remember, when making the letters T, O, and W, and the "numerical sign," to keep the two flags well separated from each other.



The flag alphabet shown in circles

When signalling, the flags must be kept unfurled, and brought smartly and promptly from one letter position to another, the arms being brought right in to the body between each letter, and a pause must be made on the letter itself. A little longer pause should be made—the signaller standing with the flags crossed—between each word. The Army regulation speed for sending and receiving semaphore messages is at the rate of eight words a minute.

In order to receive a semaphore message in the correct military manner, two receivers are really required, one to take the actual message, and one to write down each letter as it is spoken by the taker.

It is the "writer-down's" duty to say "No" should a word fail to make sense, when the receiver of the message will immediately stop the signaller by raising both arms horizontally to their full extent. The signaller will show that he has understood this by signalling back J. The receiver—who should also be armed with two flags—will then send the last word which he received correctly, when the signaller will continue with his message from that word.

To make our knowledge of signalling complete, we should practise sending figures after we have become perfectly proficient in the *alphabet*.

It is most useful to be able to signal the time, and the signalling instructions say that the numeral sign will be used for the decimal point, and when sending time, to separate the hours and minutes; thus, for instance, 5.30 will be sent: Numeral sign, 5, numeral sign, 3, 0, alphabetical sign—the alphabetical sign being used to show that letters, not figures, will follow from this point.

The semaphore code, by the way, makes a splendid schoolroom cypher, while to the uninitiated a letter looks like nothing except a row of more or less meaningless scratches, of which no sense can be made.

HOW TO SIGNAL ACROSS A FIELD

Ready to start

Letters follow

Numbers follow

Cancel previous signal

T

E

A

I

S

R

E

A

D

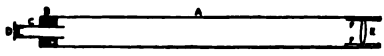
Y

These pictures show how we can "speak" across great distances. In the top row the first picture shows the signal "Ready to start"; the second means "The signs that follow are to be read as letters"; the third means "The signs that follow are to be read as numbers"; and the fourth means "Cancel previous signal." The other pictures on this page convey the message "Tea is ready," each picture representing a letter.

MAKING A SIMPLE TELESCOPE

It is possible to make a telescope, out of cardboard, that will show the mountains and dead volcanoes in the moon, of which we have all read. With this telescope we shall be able to see the moon so clearly that it will seem quite close, and we shall find it a fascinating world to watch. When it is "new" we can see the great mountains just catching the sunlight on their tops, and then, night after night, we may see the sunlight creeping towards more and more mountains, and flooding them with white light until the whole beautiful surface is bright and glowing.

Now, a simple telescope is merely a long tube with a glass lens at each end. It does not matter what the tube is made of. We are going to make ours out of sheets of brown paper, which will be stuck together until we have formed stiff cardboard. First we must find a piece of curtain-pole, about two inches thick and about three feet long. We are going to wrap our brown paper round this so as to make a tube.



1. The cardboard telescope

A. Cardboard tube. B. Piece of curtain-pole. C. Small cardboard tube for eye-piece. D. Eye-piece. E. Object lens. F. Cardboard support for lens.

When we have got this curtain-pole, and three or four large sheets of good brown paper that can be bought at any stationer's, we are ready to begin. We lay the paper out on a table and make it slightly damp with a sponge. It must not be made really wet, but only just damp enough for all the creases to come out. Now we make some glue with plenty of water. It should not be any thicker than the ordinary mucilage.

When this is ready, we take one sheet of the brown paper and wrap it once round the curtain-pole. Then, holding it so that it cannot slip, we spread some glue on the paper with a big brush and roll it round the pole bit by bit, until all the paper covered with glue has been rolled up. One or two more sheets should be stuck over the first in the same way; and then the pole, with the thick coat of paper round it, must be put away to dry.

Next morning we shall find that we can pull the curtain-pole out of the paper, and then we shall have a long tube of strong and thick cardboard that will look very neat and smooth, because the paper has shrunk a little in drying, and so there are no creases. The glue will have made it almost as hard as wood.

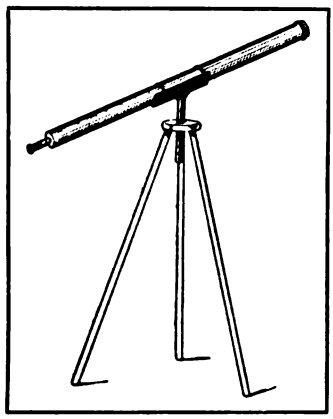
Now we must go to an optician's shop and buy the lenses. Of course, telescope lenses are made in all sizes, and we must explain exactly what we want. We shall need two, one big one, and one little one for the eye-piece.

These magnify enough for us to see some of the larger features of the moon; but, if we want to see more, then we must pay more money for the lenses. Very strong ones, that would show all the mountains and valleys splendidly, can be bought, if desired.

The optician will tell us "the focus" of the lens we buy. If he says it is 30 inches, he means that the cardboard tube we have made must be cut to 30 inches in length. If the lens is 24 inches focus, then our tube must be only 24 inches long.

When we have bought the lenses we must fit them into the tube with cardboard. First, we take the big one. Perhaps we shall find that it exactly fits into our two-inch tube; but, if it should be a little too small, we must line one end of the tube with more brown paper until it fits. Now we cut two strips of thick cardboard about one inch wide, and just long enough to go once round the inside of the tube. One of these little hoops of cardboard must be glued into the tube about three inches from the end. When that has stuck nicely, the lens is put in so that it rests against the edges of the cardboard hoop.

The other strip of cardboard must now be wound round inside the tube, and pressed against the lens. This will hold the glass in position. It should not be glued in, as sometimes it is necessary to take the lens out to clean it. Now we must make a smaller tube for the eye-piece at the other end. This small tube is made exactly like the big one; but this time we shall wrap our brown paper round a stick that is just as thick as the diameter of the eye-piece. When the tube is made, the eye-piece is fixed in, like the big lens, with cardboard, but closer to the end of the tube. Then we cut a round piece of wood the size of a half-dollar, and drill a very small hole in the centre. This is to be glued at the end of the tube, as shown in the illustration. Now we have only to fix the small tube and the big tube together. We saw off a piece of the curtain-pole, about one inch and a half long. Then, with a brace and a centre-bit, or an augur-bit, we must bore a hole large enough for the small tube to slide through. Then the piece of curtain-pole is glued in the big tube, the little tube is put in the hole, and our telescope is ready.



2. The cardboard telescope complete on tripod stand made of three broomsticks

When night comes we can point it at the moon. At first we shall see nothing but a blur of light; but if we draw the small tube backwards or forwards very gently, we shall find the correct position, and then, suddenly, we shall see the mountains of the moon.

A tripod stand, exactly like the one shown in the illustration, can be made out of three broomsticks very easily, and this will hold the telescope quite steadily in any position.

A LITTLE VEGETABLE GARDEN

WHAT TO DO IN THE MIDDLE OF JULY

JULY is the least busy month in the summer, although we may still plant out our young vegetables, such as cabbages, cauliflowers, and celery. Last month we spoke of strawberry runners; all that are not required for future plants should be cut off as they appear. A good watering may be given to the raspberry canes, should the weather be hot and dry, and especially if no mulch has been given them. A mulch, of course, is a top dressing, consisting of stable manure, mown grass, or even soil, and it helps to keep the soil moist. Raspberries are thirsty things when the fruit is forming, so that, in dry weather, either the mulch or plentiful watering is helpful.

There is something we may do for the rhubarb during the summer. We may remove the great white flower, and cut down the stem that bears it. The flower takes to itself far too much of the health and strength of the plant; in fact, we need not wait until it has grown up and expanded, but may cut it out while still close to the ground.

We must give our celery plants good supplies of water during hot, dry weather, if the soil is very light and parched, though on heavier soil, one that retains the moisture, it will not be so necessary. In its native haunts the celery is a semi-aquatic—that is to say, a water-loving plant, growing close beside water—a true aquatic, of course, grows *in* the water. It is always well to find out all we can about plants in which we are interested, and to know that the celery is a semi-aquatic is quite enough to tell us it should never be allowed to lack water.

It has been mentioned a good many times that it is a good plan to keep the soil loose between the plants of growing crops, and, with a hoe and a little fork, we should stir up the surface for a couple of inches or so.

Of course, the gardener has many enemies: our plants may be attacked by disease, or they may be destroyed, or partially destroyed, by insect pests. There are caterpillars, slugs, and wireworms, to mention but a few. Soot is generally distasteful to these, and, if the insects abound, it should be used freely. Sometimes, for instance, a gooseberry bush will have its leaves terribly destroyed by the gooseberry caterpillar, and for this dry lime, to sprinkle over the bushes, is recommended. We must not look upon worms as enemies, for they are of the greatest use in the soil; they work their way about in it, and are continually bringing up soil from a depth to the surface, thus acting as Nature's tillers of the soil in helping to keep it porous.

We have spoken of disease. Let us say a word about one that must be familiar to us all—mildew. Among other things, this may be caused by too much moisture. An effective remedy is a pennyworth of powdered sulphur, mixed with an equal quantity of dry lime, sprinkled well over the affected part. Roses are very liable to mildew, especially where they are rather closely enclosed and cannot get enough light and air.

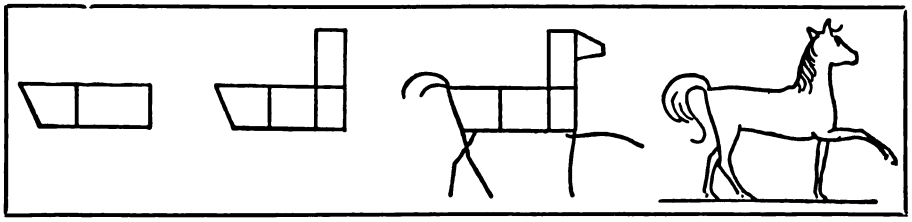
We must take great care of our dahlias at this stage of their growth, which means that we must stake them as soon as they require it, tie them to the stake, and then, as they grow taller, tie them yet again—of course, higher up. They must be made quite firm, or a sudden storm of wind and heavy rain may work havoc among them, as the stems are so exceedingly brittle. We shall do well to thin out the shoots, and if earwigs prove troublesome, we may place a flower-pot inverted upon the stake, after having put into it a little wisp of hay, or dry grass, or even paper or shavings, which serves as a trap.

All dead flowers, from all kinds of our plants, should be removed at once—as they fade, in fact—so as to prevent seed forming, for this very quickly exhausts the plants.

If we have a little collection of pot plants, either window plants or plants that we keep in the greenhouse, there will, perhaps, be among them some of a woody nature, such as azaleas, genistas, fuchsias, coronillas, deutzias. Now, these all require to have their growths thoroughly ripened, if they are to flower well next season, and to ripen the growths they need as much air and sunshine as they can get. We ought to stand the pots on a layer of ashes out of doors in a sunny spot, and water as often as necessary. The azalea should be placed in a more sunless position.

A SIMPLE WAY OF DRAWING A SPIRITED HORSE

HERE is an example of the way in which we can draw a spirited horse with ease. On page 1073 of this book we read of the way in which we can draw other pictures of this kind. We begin by drawing the figure on the left, then we carefully add the other necessary lines and rub out with eraser all the lines that cut through the body, and our horse is complete.



THE NEXT THINGS TO MAKE AND THINGS TO DO BEGIN ON PAGE 3819

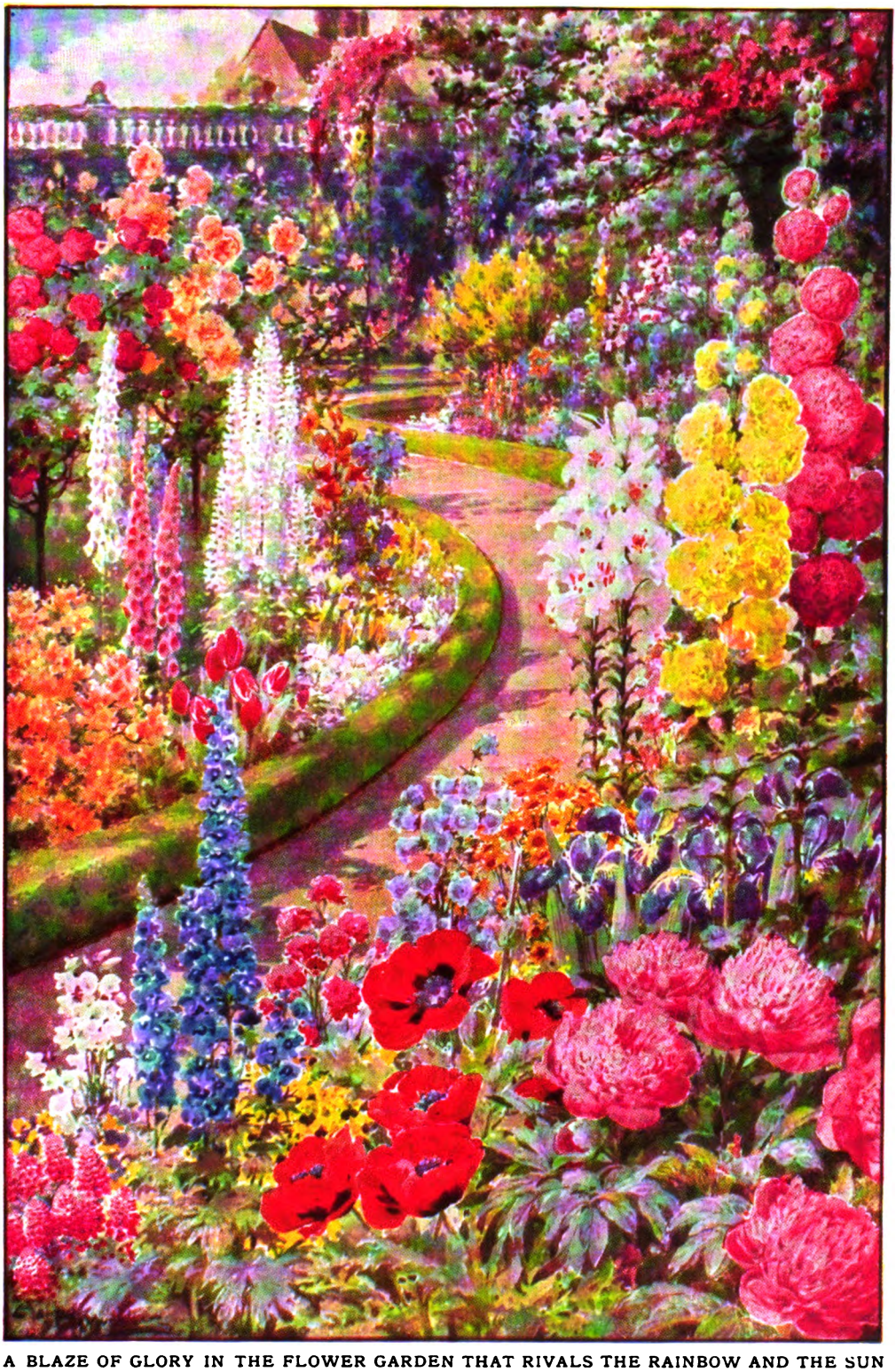
THE GLORY OF THE FLOWERS
IN GARDEN, FIELD, AND WOOD

The world would be a dark place without its flowers. From the tiny forget-me-not and the chaste and fragrant lily to the massive yet delicate chrysanthemum and the blazing sunflower we have every shape and form and colour and perfume, and, singly or massed together, the flowers present a beauty that no artist can equal. In these pages, which show the flowers of the garden, the greenhouse, and the wood, we see Nature in her loveliest dress.

A BED OF TULIPS IN MAY, PHOTOGRAPHED IN REGENT'S PARK, LONDON

A FINE SHOW OF HYACINTHS, GIVING OUT A WEALTH OF RICH PERFUME

THE WILD FLOWERS OF THE FIELD, THE WAYSIDE, THE WOODLAND, AND THE LAKE



A BLAZE OF GLORY IN THE FLOWER GARDEN THAT RIVALS THE RAINBOW AND THE SUN

CHRYSANTHEMUMS IN THEIR NATURAL COLOURS

THE STRIKING BEAUTY OF THE CHRYSANTHEMUM AS SEEN IN A GREENHOUSE

PLANT LIFE

WE have read the story of Animal Life, and we come now to the other great division of living things—Plant Life. Nothing is more wonderful than the flowers and plants that grow everywhere, filling the air with sweetness and making the earth beautiful to look upon. The story of the flowers is a story that never ends; we can never tell half of the wonderful things that are to be told about them. Some flowers are so small that we do not see them. The wind, the birds, and the beasts carry the seeds over the earth, and we can never grow tired of learning about the ways in which the flowers spread themselves. Some flowers throw up their seeds for the wind to catch and blow away; and all flowers have a wonderful cleverness in spreading themselves over the world. We read in this part of our book about the beautiful way in which Nature does her work, and we learn the story of the familiar flowers and plants of the garden and the countryside that delight us so.

HOW A FLOWER IS BORN

WHAT NATURE DOES TO KEEP THE PLANTS ALIVE

BY EDWARD STEP

WHAT is a plant? That is a question not easy to answer without using many strange words; but in most cases it is perfectly easy to tell a plant from an animal or a mineral.

If we were to see a rose-tree, a dog, and a stone, we should be able to tell at once that the rose-tree is a plant, the dog an animal, and the stone a mineral. But there are some plants that we might think were just stains on the rocks; there are some others, very small, that we might think were animals if we saw them moving through the water; and there are some kinds of animals that we might think were plants.

Many years ago we were taught that animals and plants differ from stones because they live, and that an animal differs from a plant because it *feels*. To-day we know that many plants can feel. The plant is a living thing. It has no hands, no feet, no wings, yet it can move; and some plants can take hold and climb. It has no eyes, yet it can tell darkness from light. Some plants can even catch and feed upon insects. The plant can make starch, and sugar, and fat, and many other things out of air, water, and things it finds in the earth. It breathes.

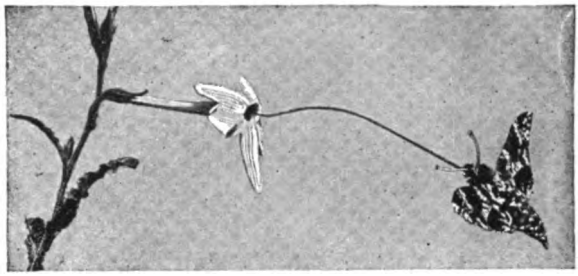
There are several names for plants of different sizes or uses. There are trees, shrubs, herbs, vegetables, grasses, ferns, mosses, and toadstools; but they are all plants of different kinds.

Let us talk a little about all these kinds of plants, and see how they get their living. We ought all to know the great work the plants are doing for us. They make the lovely flowers we are so pleased to look at and to gather when we walk in the country lanes. But that is a very small part of the work they do for us. They give us nearly all our food and much of our clothing. They give us pure air; and, indeed, we could not live if there were no plants. Think what the world would be like without plants! I am sure we should say that it was a strange and dull world.

Before plants appeared upon the earth, the world must have been just a great ball of bare, solid rock, with the sea and rivers in the hollows, and in the waters there may have been seaweeds. At first, the only place where grass and herbs could grow would be along the seashore, where the waves in great storms had broken off pieces of rock and ground it into sand.

Herbs and shrubs and trees want mould in which they can fix their roots, and mould has to be made by the plants themselves. How could plants make mould if there were no plants? we may ask. The first plants must have been very tiny ones without roots, and from the dead bodies of these enough mould would be made in which moss or grass could manage to thrive.

If we go out in winter, when there is a great deal of damp about, we shall notice patches of bright green on old fences and trees. This is made up of hundreds of thousands of tiny plants, so small that if we could place 3,000 of them in a row, so that they touched one another, the whole row would only just about reach across a nickle. Let us examine the small dot over this i. That dot, small as it is, is many times larger than one of these tiny plants, which have no roots, no stems, and no leaves or flowers. Each plant is, in appearance, just like a little round bubble, usually green, but sometimes red, and filled with fluid. If we were to take the smallest drop out of a rain-water tub, and look at it under a microscope, we should see hundreds of them. We shall find them in almost any little pool, where they feed upon the rain-water. When they have grown to their full size they break into two or more parts, and each separate part becomes round, and is a complete plant. When the pool dries up, these plants dry into a little dust, and the wind takes it through the air, and some of it sticks wherever the wind passes over a damp surface. Then the little dried-up plants soak up the moisture and begin to grow again. Of course, some of them die from old age, and their bodies decay. The wind also carries the seeds of mosses, and leaves some of them on such damp patches, where they grow. The lower parts of the mosses die, and make more mould. Then the living mosses on the top catch dust from the air, and with it come the seeds of ferns and other small plants, which now find mould deep enough to root in. Their roots find their way into chinks of the rock, and as they grow thicker they are strong enough to break up the surface of the rock. In time, we shall see, there will be a sufficient depth of mould for shrubs and trees, whose seeds may be carried far away by the wind, or dropped in distant places by birds as they travel on their annual flights from land to land. In this way the plants slowly covered up the bare rocks with their growth, and made it a place where insects and birds and grass-eating beasts could live. And after many, many years, men and women and children lived there, and found food and fruit and beautiful flowers growing up from the soil for their use and delight. If we were to be asked where we get our food and clothes from, we should say that our mothers and fathers



Insects carry pollen, a yellowish flower-dust, from flower to flower, and it is this dust that makes the seeds form. Here we see a moth with a long tongue, on which it carries pollen to a tobacco plant. Without this the plant could not give birth to other plants.

The seed of the Sand Box grows inside a skin, which bursts when ripe, and scatters the seeds.

Seeds are wonderful things. Each one contains a baby plant, with a root, a shoot, and a pair of fat leaves. When a bean-seed begins to grow it splits up its jacket, and a little white shoot pushes out into the ground. That is the root. Then the seed-leaves fall apart, leaving the plant to grow as shown in the photograph

gave them to us. That would be quite true; and we know that they first get them from the butcher, the baker, the grocer, the greengrocer, the tailor, the shoemaker, and the draper. But these tradesmen only prepare the things we need. The true answer is, our food and clothes come really from the plants. The meat comes from the ox and the sheep, but these build up their bodies by eating grass. The baker's flour is the crushed seeds of wheat; the tailor's cloth is made from the sheep's wool; the shoemaker's leather is made from the skin of the ox; the draper's linen is made from the stems of the flax plant.

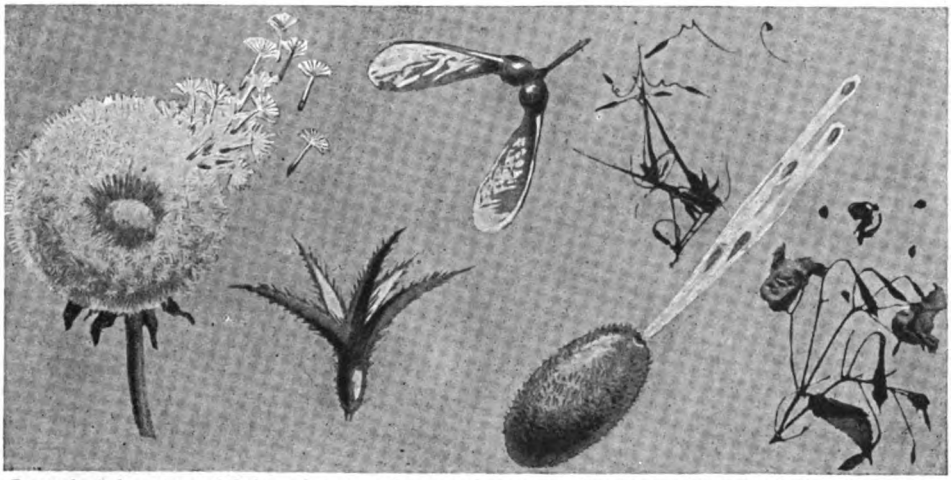
Everything we need comes, in the first place, from the plants, and the plants make it all from air, and water, and the rocks. Every breath we breathe *out* is poison to us, but the plants take the poison out of it, and make it fit for us to breathe *in* again.

If we were to place the wisest man upon an island where there were no plants, but plenty of rocks, air, and water around him, do we think he could make food and clothing out of them? We are sure he could not, even if he were the wisest man that ever lived. But the plants do it. And not only do they give us bread and milk, meat and potatoes, but juicy fruit and sweets to eat, clothes to wear, and lovely flowers to look at. Though plants have no hands or feet, and cannot talk, they must be very clever creatures to be able to do what man, with all his wisdom, cannot do.

In many of their ways plants are much like animals. They all try to get what are for them the best places. All the plants with green leaves want plenty of sunshine, and the trees in a forest are so afraid that their neighbours will shade them that they put out new shoots only at the top, to reach up as high as they can. Some plants are so good to eat that they have to cover their lower shoots, or leaves, with sharp spines, to prick the noses of animals that would eat them. Some make poisons instead of spines, and spread them in their leaves, so that no animal that has once tasted them wants to do so again. Others want bees to work for them, and these provide a sweet drink to attract.

What we call seeds are the eggs of the plant, and some of the plants like their seeds to be taken away where they will have more room to grow than if they dropped close to the old plant. So these plants fit each seed with a sail, that the wind may carry it off, or with hooks, which can be fixed in the coat of any bird or beast that passes by. Others shoot their seeds to the proper distance; but some that grow in less crowded places drop their seeds around them, so that their

SOME OF THE STRANGE WAYS IN WHICH PLANTS SPREAD THEIR SEEDS



Some plants have to send their seeds to grow far away from the mother plant, and these seeds have downy tops, like the dandelion, on the left of the picture, or claws, like the starry-headed trefoil, which is next to it, or wings for the wind to carry them, like the maple-seed, which is seen higher up. Others have hooks to fix in the wings of birds or the coats of animals, and some, like the squirting cucumber, shoot their seeds to the proper distance.

young ones may be able to grow up under the shelter of the parent plants. Now, these seeds are all very wonderful things. Each one of them contains a baby plant, with a root and a shoot and a pair of fat leaves. These seed-leaves are fat, because they are the pockets of the little plant, whose mother, before sending her baby plant away, has filled its pockets with enough food to feed it until it has got its root firmly fixed in the ground, and its shoot growing up to the sun.

If we soak a bean-seed in water for a day, then lay it on moist earth in a flower-pot, and put it in a warm place, this is what will happen. The bean will soon begin to grow, and the first sign that it is growing will be the splitting up of its jacket, which has become too small for it. As the slit widens we shall be able to see that the real seed inside is in halves, joined together in only one small place. These halves are the bean's pockets filled with food, and between lies the baby plant. In a few days a little white shoot pushes out, and as it grows longer its pointed tip bends to the mould and pushes into it. That is the baby bean's root. When it is far enough in to get a good hold of the soil, it lifts up the bean, which had been lying on its side. Then the fat seed-leaves fall apart, and in between them we see a pair of very tiny leaves with their edges folded together. These little leaves grow very fast, and are soon as big as one's hand, and as they grow large the fat seed-leaves get small and wither. We see that the baby bean is eating up its food and its pockets are getting empty. But now it has got those large green leaves it will be able to work for itself, and get all the food it wants from the mould and the air. And that is how the mother plant sends her baby away—always with enough food to last until it is big enough to get its own living.

Now that we have seen what a seed really is, let us have a short talk about how seeds are formed. We must know that the great object of every plant is to be able to ripen seeds, in order that the race may not die out. To ripen seeds the plant must first have flowers; and the plant's sole excuse for devoting so much of its energy and substance to the making of showy blossoms is that it must, at any cost, produce seeds.

Many plants, such as we call annuals and biennials, because they come up every year or every two years, ripen their seeds and then die. They have given their lives to this effort, and, the work being done, they die.

If we were asked which part of a flower we thought of most value, we should almost certainly point to the brightly coloured petals, and say "These!" But we should be wrong.

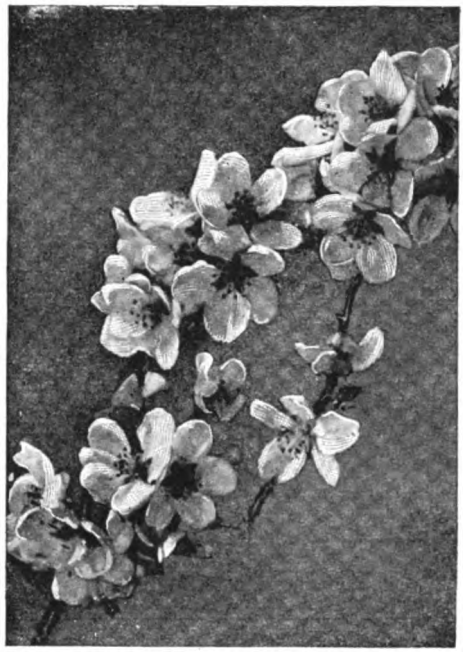
The petals are of great value to the plant, and it pours its richest colours into them to make them as bright and showy as it can. Yet there are some flowers that have no petals. The most important parts of a flower are the green and yellow pins and threads in the centre; the parts that are often hidden by folds of the petals; the parts that some people think a fault when they appear in double garden flowers. Where there are bright petals they do not exist solely to make us pleased with the flower, but in order that insects shall be able to see the flower from a distance, and come to it, to help the plant to form its seeds. To induce the insects to come, many flowers are fitted with little glands that pour out from their surface a sweet fluid called nectar, and they also give out a sweet scent, which bees, butterflies, and moths look upon as a notice that sips of nectar may be had, free of cost, if they will follow up this scent to the bright-hued flower. The flowers that do not want the aid of the insects have small shabby petals, or no petals at all. Now, the plant that wishes the bee, the moth, or the butterfly to come to the flower, takes care that this nectar shall not be got at by ants, or beetles, or common flies; and all kinds of tricks have been learned by the plant to guard its nectar

A PLANT THAT CATCHES FLIES

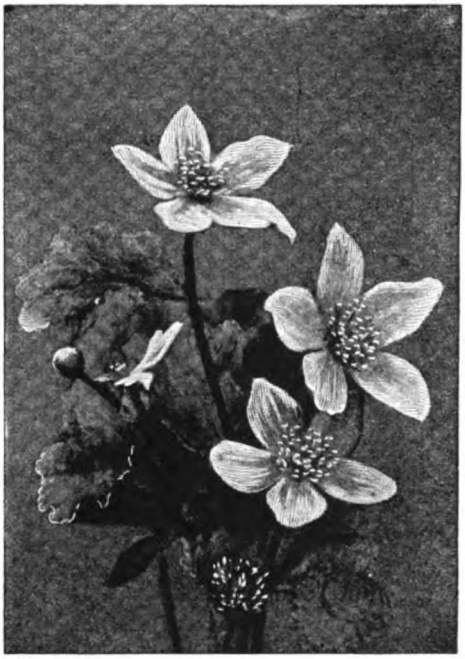
This plant, called the Venus Fly-trap, opens its leaves to tempt insects inside and then closes them and traps the insect to its death.

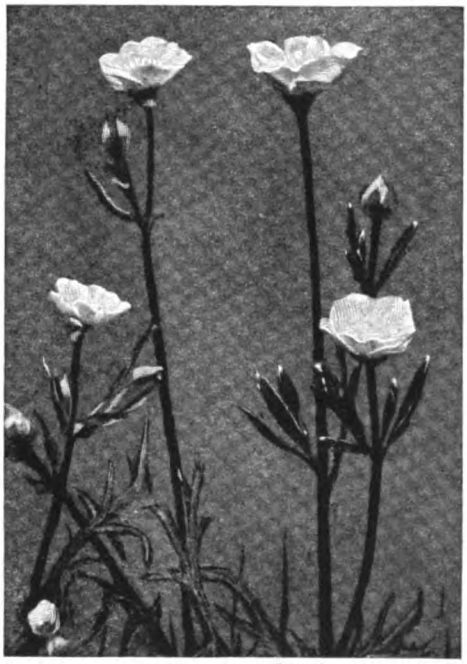
HOW FLOWERS INVITE THEIR LITTLE GUESTS

If we look at this picture of the honeysuckle, or woodbine, we shall see the pins and threads standing out from the mouth of the trumpet-shaped blossom.



This is a spray of apple blossom. The apple blossom, like the buttercup and marsh marigold, attracts insects, and gives them nectar in return for pollen.

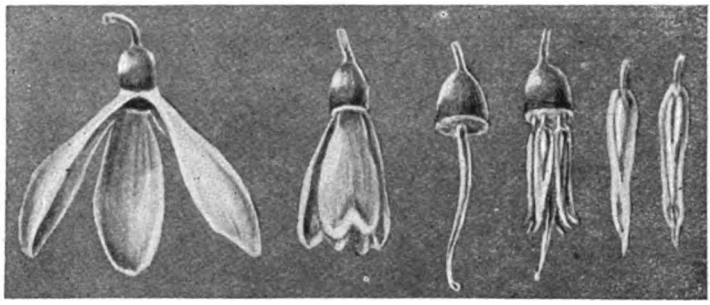




Flowers have many ways of attracting insects, in order to get an exchange of pollen. The first of these two pictures shows us marsh marigolds, and the other is a photograph of buttercups. The marsh marigold and the buttercup seem to say to insects that all will be welcome, for they hold the nectar in little cups where all can get at it. The marsh marigold has large leaves after fertilisation, but during the flowering period the leaves are kept quite small, so that they may not conceal the blossoms from the insects that must visit them for fertilising purposes.

from such robbers. The columbine and the garden nasturtiums have long, hollow tails, and the nectar is poured out at the bottom of these, so that only insects with long, thin tongues can reach it. The honeysuckle has long, trumpet-shaped flowers with nectar at the bottom.

But moths and butterflies have their tongues grown into long, hollow tubes like the trunk of an elephant, and they can reach the nectar with ease. On the other hand, there are many plants that do not want bees or butterflies, preferring the visits of beetles and flies. These spread their nectar on flat, open parts of the flower where these short-tongued insects can lick it up. But the long-tongued insects are not too proud at times to take a drink at these flowers. The ivy has flowers of this kind; and in autumn, along hedges where the ivy grows, swarms of bluebottles may be seen, greenbottles, bees, and butterflies, all crowding around the flat dishes on which the ivy has spread her nectar.



SEPALS PETALS PISTIL STAMENS

These are the parts of simple flowers, such as the snowdrop. The snowdrop's bud hangs down and the white part splits into three sepals. The sepals spread out their tips and show us three petals inside. In the centre is a sort of pin called the pistil, with the seeds packed in the knob of the stalk, and around the pistil are six slender stamens, shown here attached and also loose, inside and out.

Flowers like those of the carrot spread their nectar on flat plates for the beetles and flies, so the butterflies pass them by as being too much like a fox's feast. Some plants, like the buttercups and marsh marigold, seem to say to insects in general that all will be welcome, for the nectar is held in little cups, in open flowers, where all can get at it without trouble. Some plants, like the foxglove, have so adapted their flowers to the shape and size of the humble-bee that no other insect can get at the nectar; for though it seems easy for small creeping insects to crawl into the large bell, their way is blocked by stiff hairs that are easily pushed aside by the strong bee.

We have not yet learnt *why* the flowers are so anxious for these insects to come that it is worth their while to attract them by bright petals and sweet scents, and then to reward them with nectar. If we look at the honeysuckle we shall see the pins and threads standing far out from the mouth of the trumpet. There are six of these to each trumpet, and one is different from the others. Five are shaped like hammers with very long handles; the sixth is without the hammer-head, and ends in a little sticky knob like the head of a pin. If we pull the flower to pieces carefully, splitting the trumpet down the middle, so that we can see the bottom of it, we shall find that this long pin ends in a rounded green knob below the thin end of the trumpet. Inside this knob are many little white specks. The knob and the thread together are called the *pistil*.

The five hammer-heads are *stamens*. They split open and give out a mealy, yellow powder called *pollen*. If a grain of pollen is placed on the sticky end of the pistil, the pollen sends out a shoot which pierces the pistil and finds its way right down to a little white speck in the knob, and pierces that also. Then a strange thing happens. The white speck begins to grow, the knob grows larger, and the trumpet drops off. The green knob becomes a juicy red berry and the white specks become seeds. But unless the pollen gets on the tip of the pistil there will be no seed.

In most of the brightly coloured flowers the stamens and the pistil ripen on different days, or else the stamens are so placed that the pollen cannot fall on the pistil of the same flower. That is because these flowers cannot grow seeds from their own pollen. The insects fly to these bright flowers, and as they fly they pick up pollen on their hairy bodies and rub against the sticky pistils, leaving a little behind.

The next story of Plant Life is on 3827.

WRITERS OF FAMOUS SONGS

CONTINUED FROM 3706

A FAMOUS man once said that he would rather make the songs of a country than make its laws. He meant that songs had such a hold on the people that, if they were good songs, they were better worth considering as a moral power than the laws which are made for us by the legislatures or by Congress. That was going just a little too far. But there is a great deal of truth in the saying. Songs really do have a great influence. Many of us know "Home, Sweet Home," or "The Last Rose of Summer," or "Auld Lang Syne," or "The Star-Spangled Banner," before we know much about the laws of our country. And we get not only ideas and principles from songs, but even powerful incentives to action.

We are going to learn something about our most popular songs, and about the men and women who wrote them; and we may give first place to Rouget de Lisle, who produced the French "Marseillaise." We seldom hear the "Marseillaise" now, for we live in comparatively quiet times; and, besides that, the French Government did not allow it to be publicly sung or played until 1879. But we shall know the tremendous effect it once had if we read any story of the French Revolution. Carlyle says: "The sound of it will make the blood tingle in men's veins; and whole armies and assemblages will sing it with eyes weeping and burning, with hearts defiant of Death, Despot, and Devil." One republican general declared that it was worth an addition of a thousand men to his ranks; and there was a great German poet who said that it had caused the death of 50,000 of his countrymen.

The author of this grand martial song, Rouget de Lisle, was a captain of engineers stationed at Strasburg just before the French Revolution broke out in all its fury. He was an all-round man: poet, dramatist, violinist, and singer; and he wrote the song in a mood of excitement and inspiration one heated night in April, 1792. On page 2269 of this book we see him singing the song to his friends. To its strains the soldiers from Marseilles entered Paris, and marched to the attack on the Tuileries.

It was because of this connection with Marseilles that the song was called the "Marseillaise." De Lisle got a pension from Louis XVIII. on account of the song; and we can see a monument erected

to his memory in the town of Choisy-le-Roi, where he died in 1836.

There is nothing even nearly resembling the "Marsellaise" among English songs. "God Save the King," about the origin and authorship of which nobody is really certain, is almost tame by comparison with the fiery French strain. Unless it be "Boyne Water," no one gets excited about any English song; and it is only Irishmen who are apt to get a little warm over *that*, because it reminds them of the battle on the banks of the Boyne, fought in 1690, when William III. defeated James II.

A STIRRING NATIONAL SONG WRITTEN BY THE POET OF NATURE

But there is "Rule, Britannia," a grand song which Southey, the poet, said would be the battle-hymn of England so long as England maintained her political power. It is a pity we should not be able to say with absolute certainty who is the author of this stirring piece. The difficulty arises in this way: "Rule, Britannia" appeared first in a sort of stage-play, written in 1740, to commemorate the accession of George I. The authors of the play were James Thomson, the poet of "The Seasons," and David Mallet; and, unfortunately, they did not show, by putting their names to them, just which parts of the play they had each written. Thomson died in 1748, before "Rule, Britannia" became very popular; so he had no special reason for claiming it for himself, supposing it were his.

But experts who have looked into the matter generally give him the honour, and we may safely follow them. "Jemmy" Thomson, as they familiarly called him, was not a great poet, but lovers of Nature and the open air still like to read his book "The Seasons." He took life so easily—so indolently, we should say—that he could often be seen standing in his garden at Richmond, Surrey, eating the peaches off the trees, with his hands in his pockets.

A SCOTTISH POET AND HIS FAMOUS SONGS OF NELSON AND THE SEA

After him we may mention his brother Scot, Thomas Campbell, considered a great poet in his day. He was a Glasgow man, born in 1777, and he wrote his once popular "Pleasures of Hope" when he was only twenty-one. His reputation is not nearly so great as it was, but we shall never forget his war-songs, such as "Hohenlinden," and the magnificent "Battle of the Baltic," describing incidents connected with Nelson's historic fight at Copenhagen in 1801. It was Campbell, too, who sang of "The Exile of Erin," and made "Ye Mariners of England" immortal. The last-named was written in imitation of an old seventeenth-century song bearing the same name, which Campbell used to sing at musical parties in Edinburgh. It is one of the most stirring of his war-pieces.

While we are thinking of this song, let us think of some more sea-songs known to us. The man who wrote the greatest number of sea-songs was Charles Dibdin. Everybody has heard his "Tom Bowling," and if we don't often hear his "Poor Jack," or "I Sailed from the Downs in the Nancy," or "'Twas in the good ship Rover," and other old-time favourites from his pen, we are probably hearing much less entertaining and breezy things.

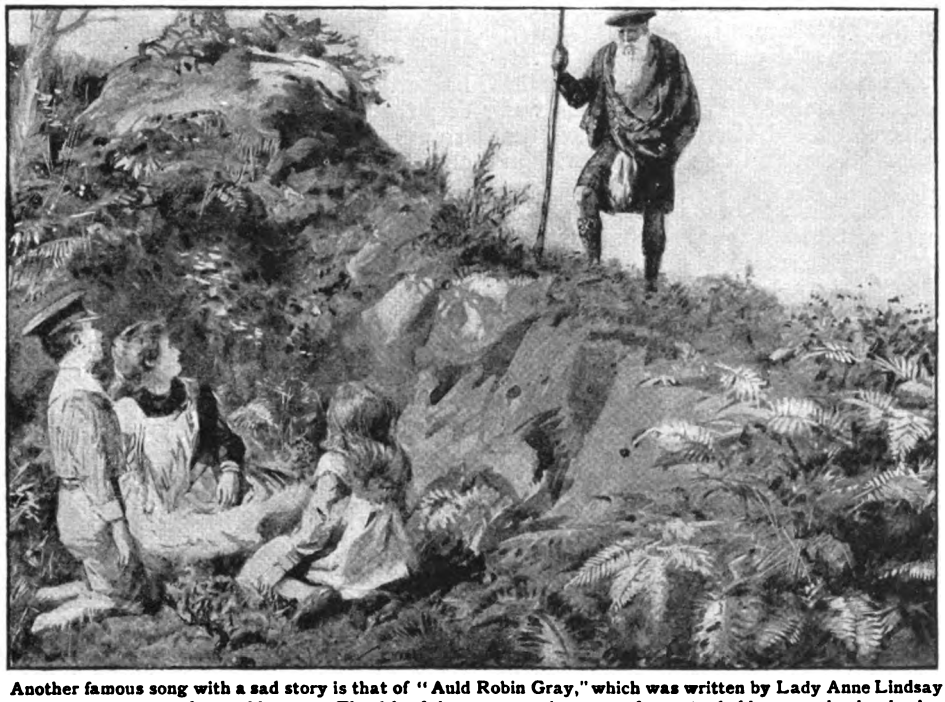
A WRITER OF SEA-SONGS WHO KNEW LITTLE OF SAILORS OR THE SEA

Dibdin had very little personal acquaintance with either sailors or the sea; but up to his time the British tar had not received much attention in song, and, as Dibdin had a great liking for the plain, manly, honest, patriotic character of the British tar, he resolved to make verses about him. His songs had a real practical effect, for they moved to heroic deeds thousands of England's sailors, besides warming their hearts in hours of merriment, and lightening their dreary hours when prisoners in the hands of the enemy. Poor Dibdin had rather a hard life, but the Government, in his later days, gave him a pension for his sea-songs. He died in 1814, at the age of sixty-nine, and was buried in St. Martin's Cemetery, Camden Town, where the late Lady Rosebery unveiled a memorial to him in 1888.

Of course, there were other writers of sea-songs besides Dibdin. We think of David Garrick chiefly as a great actor, but it was David Garrick who wrote that grand patriotic song, "Hearts of Oak." He wrote it under the inspiration of that wonderful year, 1759, of which it makes mention—the year of Quiberon and Quebec and Minden, when the British arms were covered

PICTURE-STORIES OF TWO FAMOUS SONGS

We all know the sad story of "The Mistletoe Bough," the song that is so often played by serenaders at Christmas-time. The bride of Lord Lovel, on her wedding night, hid for fun in a large oak chest, but the lid closed down and the spring lock fastened her in. Many years later her skeleton was found in the chest.



Another famous song with a sad story is that of "Auld Robin Gray," which was written by Lady Anne Lindsay to raise some money for an old nurse. The title of the song was the name of an actual old man, a shepherd, who, when Lady Anne with her brother and sister as children ran away from home, took them back to their mother.

with glory by Lord Hawke and General Wolfe and the Marquis of Granby. We know all about Garrick, but we know very little about the man who gave us that other familiar sea-song, "Ben Bolt." His name was Thomas Dunn English. He was an American, a life-long friend of Edgar Allan Poe, the author of "The Raven," and he died so recently as 1902.

Then we ought to mention Andrew Cherry, who wrote "The Bay of Biscay," and also the best song that we have about "The dear little Shamrock of Ireland." Cherry was the son of a Limerick book-seller. He took to the stage, and appeared, with much applause, as the newspapers said, at Drury Lane Theatre in 1802, ten years before his death. Nor must we forget Samuel J. Arnold, who provided us with "The Death of Nelson," one of the greatest national songs. Arnold was very fond of sea-subjects, and wrote another once popular song, "Speed on, my Bark, speed on." He was a son of Dr. Arnold, the famous composer.

A SONG THAT WAS SUNG AGAIN & AGAIN TILL THE SINGER COULD SING NO MORE

"The Death of Nelson" appeared in an opera produced in London not very long after the great admiral's death. Braham, the great tenor, who once sold pencils in the street, had written the music, and it was he who sang it first. The enthusiasm was tremendous. Nelson had been the nation's hero, and this song about him had to be repeated again and again, until Braham was in a state of collapse. Among the sea-songs we must not forget "Rocked in the Cradle of the Deep." It was written by Mrs. Willard, an American, but we should probably never have heard of it had not a clergyman, the Rev. Joseph Knight, made for it the fine tune that we know so well.

But we must think of the soldiers as well as of the sailors. To be sure, there are not so many songs about soldiers as about sailors, perhaps because there is less romance about life on land than about life at sea. But we have "The British Grenadiers," a song about which we know nothing more than this, that the words date from about 1690, and that the tune comes down from the sixteenth century. And then we have the favourite, "The Girl I left behind Me," which may be regarded as the property of both soldiers and sailors. It has been played for a century or more when a man-of-war weighs anchor, and when a regiment quits the town in which it has been quartered; consequently it is known wherever English-speaking soldiers and sailors go.

SONGS THAT ARE SUNG WHEN THE NATION IS REJOICING

Some of us are old enough to remember the rejoicings that took place over the relief of Ladysmith. Well, in the days of the Crimea the English had similar cause for rejoicing, as it was then that they sang: "Cheer, boys, cheer, Sebastopol is taken." That was one of the most popular songs of the day. It was written by Charles Mackay, a Scotsman, who adopted as a daughter the now distinguished novelist, Miss Marie Corelli. But Mackay's words would not have been so popular if a certain Mr. Henry Russell had not set them to catchy music.

Henry Russell was a popular song and story entertainer for many years, and he wrote many songs, both words and music, of his own. We all know his "A Life on the Ocean Wave," and his setting of Dickens' pretty verses about "The Ivy Green." He was a very realistic singer, and moved his audiences strongly. Once he sang a song which he had written about a Newfoundland dog that had bravely leapt overboard from a vessel and saved a drowning child. At the end of the song, a man in the gallery called out: "Mr. Russell, if that dog is yours, I'll give you a sovereign for a pup."

Russell had been fondled on the knees of George IV., but it is only a few years since he died. It is his son, Mr. Clark Russell, who has given us so many interesting and stirring sea-stories.

SAD SONGS THAT OUR GRANDMOTHERS USED TO SING

Then there was Thomas Haynes Bayly. We do not know his songs so well as our grandfathers and grandmothers used to know them; but we know at least "The Mistletoe Bough," and we have heard of "She wore a Wreath of Roses," and of "Oh, no! We Never Mention Her," of "I'll hang my Harp on a Willow Tree," and of "Gaily the Troubadour touched his Guitar." Bayly was born in the old town of Bath in 1797, and died in 1839, after

years of misfortune. His father was a solicitor, and he also wanted his son to become a solicitor. But the youth took a great dislike to the law. The father then tried him with the Church, but he did not like that either; so at last he joined the ranks of those who looked to literature for a living. There is a fine old flavour about his songs, something like what we should experience, perhaps, if we opened an old bureau and turned over the letters of our grandmothers.

Mr. Andrew Lang says it is "like listening, in the sad yellow evening, to the strains of a barrel-organ, faint and sweet, and far away." And so it is. Bayly could play beautifully with old romance, and in that direction song has nothing more effective to show us than "The Mistletoe Bough." When the bride got into the ancient chest,

> "It closed with a spring. And, dreadful doom!
> The bride lay clasped in her living tomb;"

so that her lover "mourned for his fairy bride," and never discovered the whereabouts of her premature tomb.

SOME FAMOUS SONGS THAT WERE WRITTEN ABOUT REAL PEOPLE

It is said that such an incident once really happened. And that may serve to remind us that famous songs have often been made about real people. There is "Annie Laurie," for instance. Few of us probably think of Annie Laurie as having existed in real life. But she did. If we go to Dumfries to-day we may see her "last will and testament" in one of the institutions there. We know that the song begins "Maxwelton braes are bonnie," and Maxwelton is near Dumfries. Well, Annie Laurie was born at Maxwelton, in December, 1682; and to-day she lies at rest in Dunscore churchyard, about which Carlyle often speaks in his letters, for he, too, belonged to that district.

Now, this Annie Laurie had a sweetheart—a certain Mr. Douglas—and it was he who made the original of the song about her. But his lines were not very refined, and so they were recast about seventy years ago by Lady John Scott, a member of the great Buccleuch family, who died in 1900. She had no idea that her version of the old song would become popular, but she printed it for a bazaar held on behalf of the widows and orphans of soldiers who had been killed in the Crimea, and it was soon taken up and sung everywhere.

A FAMOUS SONG THAT WAS WRITTEN BY A FARMER'S SON IN TEN MINUTES

Then there is "My Pretty Jane," a song which that great tenor, Mr. Sims Reeves, made immortal by his splendid rendering of it. This song was written by Edward Fitzball, a farmer's son, who used to wander about the lanes of Burwell, a little village some eleven miles from Cambridge. Near one of these lanes "a farmer did dwell," as the song says. He had a daughter, and she was the "pretty Jane." Jane had a bewitching manner, and Fitzball fell madly in love with her.

One morning he sat down in his father's fields, when the bloom was on the rye, and wrote this song in ten minutes. Later on, he gave the words to Sir Henry Bishop, the man who composed the tune for "Home, Sweet Home," and Bishop produced the melody which has literally gone round the world. It is sad to have to add that "My pretty Jane" died of consumption in the height of her youth and beauty.

"The Lass of Richmond Hill," too, was a real heroine. Some tell us that she belonged to the Richmond in Surrey, perhaps because there is, or was, a public-house there called "The Lass of Richmond Hill." But she was the daughter of a King's Bench solicitor who had a place called "Hill House," in Richmond, Yorkshire. Her name was Frances I'Anson. She married Leonard MacNally, an Irish barrister, and it was he who wrote the song about her which has become so popular.

THE ALLEY POET, WHOSE SONG WAS SUNG IN ROYAL PALACES

Still another real heroine was Henry Carey's "Sally in our Alley." Sally was, in fact, a London girl who had gone out one holiday with her sweetheart. Carey happened to notice the pair, and the song was the result of his study of them. All London roared at the idea of making a song on such a subject, and they made Carey very unhappy by calling him the "alley poet." But he lived to see his song make its way into the very best society, and even to hear of it being sung in the royal palace.

So far, we have not noticed any of the lady song-writers. Now, when we come to think of them, it is curious to reflect that they were mostly Scottish women; still more curious to note that two of them, at least, wanted to hide what they had done. There was first Lady Anne Lindsay, who wrote the fine ballad of "Auld Robin Gray," for which Mr. Leeves, a Somerset clergyman, made such an exquisite tune. She was one of a family who had long been known for their literary and artistic gifts. Her father was the Earl of Balcarres, and she was born in 1750. Her mother, who was very severe, used to shut her children into dark closets or give them only bread and water when they did anything wrong.

One day the young people decided to rebel and run away. They did run away, but the old shepherd of the place stopped them and brought them back to be punished. Now, the shepherd's name was Robin Gray, and it was the memory of this incident in her young days that made Lady Anne take his name for her song, when she came to write it many years later.

How people tried to discover the author of a very popular song

The song soon became popular, but she had not put her name to it, and people began to ask about the authorship. Indeed a learned Edinburgh society offered a hundred dollars for the name of the writer. This strikes us as very curious nowadays, when we find everybody rather proud of being able to write. But we must remember that people were not so proud of writing a hundred years ago. We all know how Scott wrote the Waverley novels secretly. People occupying a high station in life thought it undignified to write for print. What Lady Lindsay said about it was this. She declared she had a dread of writing anything "because of the shyness it created in those who could write nothing." In other words, she did not want to make people who could not write uncomfortable in her presence.

Another great lady writer of Scottish songs held the same view. This was Lady Nairne, the author of "The Land o' the Leal" and "Caller Herrin'," and a goodly number of songs about Bonnie Prince Charlie and the fight he made in 1745–1746 for the crown of his fathers. Lady Nairne sent her songs to the publisher under the name of "Mrs. Bogan," and when she went to see him at his office she went disguised.

A song that brought comfort to a sorrowing mother

She is best known now by "The Land o' the Leal," which was written to console a dear married friend who had lost her first-born child. That is the meaning of the line, "Oor bonnie Bairn's there, John"; for the land o' the leal means heaven, and not, as some people think, the country north of the Tweed. Lady Nairne belonged to an old family who had fought and bled for the Stuarts, so it was no wonder that she made so many fine songs about the Jacobites and about the cause which ended so disastrously at Culloden.

But there were other writers of songs about Prince Charlie besides Lady Nairne. There was James Hogg, for instance, better known as the "Ettrick Shepherd"—one of the most wonderful natural geniuses that Scotland ever produced. He got little more than six months' schooling, and he was a man before he could write down the letters of the alphabet correctly; yet he gave us such songs as "Bonnie Prince Charlie," "Flora Macdonald's Lament," "Come o'er the Stream, Charlie," and "When the Kye comes Hame." He was a real shepherd, and lived all his days near that Yarrow of which Wordsworth has written so tenderly. William Glen, a Glasgow merchant, should also be mentioned for his "Wae's Me for Prince Charlie," a song which the late Queen Victoria often asked for when anybody was singing in her presence.

The famous poet of Ireland and the beautiful songs he wrote

Of writers of Irish songs which have become famous, quite a number might be mentioned. Perhaps there is nothing more popular than Tom Moore's "Last Rose of Summer," though "Robin Adair," the writer of which we do not know, runs it pretty close. Moore was a perfect master of song-writing, and his "Irish Melodies" included many songs that were once greatly popular. Some, indeed, such as "The Minstrel Boy to the War has Gone" and "The Harp that once thro' Tara's Halls," are still widely known, and are often

heard upon the concert platform. Moore is, without question, one of the greatest English song-writers. His sentiments are so beautifully expressed that they appeal not only to the Irish nation, but to the whole Anglo-Saxon race. It was Samuel Lover, the novelist, who gave us "Rory O'More," which became so popular that it was played by most bands when Queen Victoria was crowned. "The Wearin' o' the Green" is always in great request at Irish patriotic gatherings. Both the Irish exile and the Irish patriot find their sentiments reflected in it, and its vein of melancholy appeals

Henry Carey, the poet, who was at one time thought to be the author and composer of "God Save the King," is best known now by his popular song "Sally in our Alley." Carey wrote this song after seeing a London girl of the poorer class out for a holiday with her sweetheart, a scene beautifully pictured here by the artist.

to them. There are many versions; but the favourite one is that written by Boucicault, the actor.

The name of the author of "The Cruiskeen Lawn," another popular Irish song which Boucicault introduced into "The Colleen Bawn," is lost to us for ever. But we know all about "Kathleen Mavourneen," the beautiful song which was written by an Irish lady, Mrs. Crawford, and set to music by Mr. F. N. Crouch, who had sung as a choir-boy in Westminster Abbey. Crouch got just $25 for his music—the same as Milton got for "Paradise Lost"—but when the copyright was sold some years ago it realised the substantial sum of $3,000.

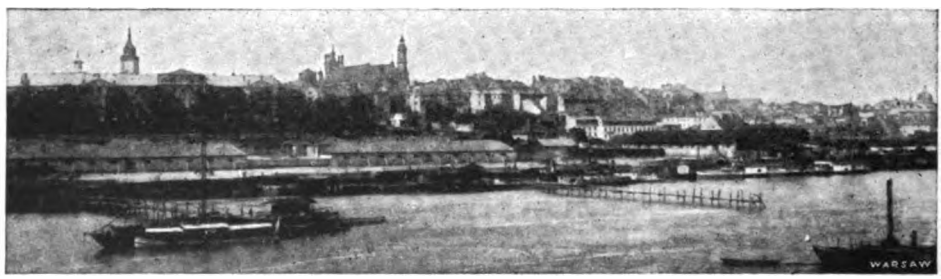
It was the music of Michael William Balfe that made the song of "Killarney," written by Mr. E. Falconer, known in all English-speaking lands. If Balfe had written nothing but this song and the opera of "The Bohemian Girl," his name would have been handed down to posterity.

There are many more songs which can be mentioned only briefly, such, for example, as the famous "Cherry Ripe," the words of which were written by Robert Herrick, and the "Vicar of Bray."

In another article on American songs we shall learn all about "Yankee Doodle," "Dixie," "The Star-Spangled Banner," "John Brown's Body," "When Johnny Comes Marching Home," and many another lyric, the lilting melodies of which are known to our cousins in the British Empire as well as they are known to us. And then there are such national songs as "The Watch on the Rhine" and "The Sicilian Mariners' Hymn," but to say only a little about each one of all the songs that have become popular would require a whole book.

The next Men & Women begin on page 3903

GREAT CITIES OF THE RUSSIAN EMPIRE



Moscow is the ancient capital of the Russian Empire, Kiev is another ancient city, and Warsaw is the old capital of Poland. To the great annual fair at Nijni-Novgorod 400,000 traders bring $120,000,000 worth of goods.

RUSSIA AS IT IS TO-DAY

CONTINUED FROM 3632

MORE than half of Europe, added to more than one-third of Asia, or about one-sixth part of all the land of the world—such is the size of the dominions of the Czar of all the Russias to-day!

We have already seen how this vast Eurasian empire has grown through the centuries from some small inland states about the Dnieper and Volga rivers, till it reached the White Sea, the Baltic Sea, and the Black Sea, and across thousands of miles to the Pacific. Let us now, with our maps and pictures before us, try to gain some idea of what there is to see in these 8,500,000 square miles of the earth's surface, in the country and in the towns; also, where and how the 148,000,000 people under the rule of the Czar live and work.

First, from the map we gather that there are vast districts in Russia—as in the north of Canada and the middle of Australia—unsuitable for people to live in. Round the shores of the frozen sea, and on the tundras, or dreary plains, where the winter is dark and long, and the summer is short and hot, very few people live. These few people wander about with herds of reindeer, as in the north of Scandinavia; or they fish, or hunt bears and foxes for their furs, and use sledges, drawn by teams of dogs, to travel over the ice and snow. South of the tundras are miles and miles of forests, spreading darkly farther than the eye can see. For the most part, these are silent, like the icy plains, though, where transport is possible, men gather to cut down and despatch the timber, which is one of the chief products Russia has to sell.

Then, again, to the south of the empire there is a belt of land with very few people living upon it—a belt stretching from the north of the Black Sea and the Caspian Sea to the Sea of Aral, and onwards to the heights of Central Asia. Some of this land is bare save for grass, and there herds of cattle roam far and wide; some is desert and rocky, scorching hot and dry in summer, and cold, with winds cutting like a razor, in winter.

So where shall we look for the subjects of the Czar? The vast majority of them are the peasants, who were serfs, or slaves, only fifty years ago, and other tillers of the soil, scattered over countless fields growing corn and other crops, where the earth is black and rich, and watered by many rivers. The peasants, for the most part, lead dull,

sad lives, and are terribly poor. Sometimes famines cause desperate starvation in the land that produces and sells to other countries great quantities of grain. The intense cold, too, also brings much suffering to the poor, for nearly all over Russia, except on the Black Sea Riviera, snow and ice last for months. Some go into the towns to work when nothing can be done in the fields; but, in most cases, the poor creatures paste up every cranny that lets in air to their wretched hovels, light a stove, which is kept going, if possible, night and day, and resign themselves to a wretched existence, often stupefied with a strong spirit called vodka.

Very hard, too, is the lot of the many thousands of miners in Russia. These we shall find about the Ural Mountains—there is an obelisk on one of these with Europe engraved on one side, and Asia on the other—and the Altai, or Gold Mountains, in Siberia, on the borders of China, and on the various coal-fields, chiefly round the important towns of Moscow and Warsaw.

THE UNTOLD WEALTH THAT LIES BURIED UNDERGROUND IN RUSSIA

The mineral wealth of Russia is untold, and is not yet half worked; neither does it go to enrich the country nor to help pay for the costly reforms which are so urgently needed. There are iron, copper, gold, and silver among valuable metals; every variety of precious stones, marbles, and agates; and thousands of unhappy beings toil year after year, wresting these minerals from their dark hiding-places in Mother Earth's rich stores. Those who have broken the laws, and, alas! sometimes those who are only suspected of breaking them, are sent—as British convicts used to be sent to Australia—to Siberia, as exiles or prisoners, or to work in the mines.

Others of Russia's millions are to be found by the waters that cover so much of its surface, working and building the steamers and the infinite variety of boats and barges that travel on the rivers, canals, and lakes. Others are engaged in fishing, for fish is extraordinarily plentiful, and is much needed, as there are so many fasts in the Eastern Church, when no flesh food, but only fish, is allowed to be eaten. Russia is not yet a great manufacturing country, although many iron, steel, copper, and textile works are rapidly growing up; so, at present, we find no districts densely peopled, with towns almost joining each other, as in our own cotton, woollen, iron-working, and ship-building centres. But there are innumerable towns in Russia, most of them very interesting, chiefly situated on the old great river highways; and more are now rising up along the vast new iron highways—the railways—that link up the north and south, and the east and west of the huge empire.

THE CITY OF PETER THE GREAT, THAT SEEMS TO FLOAT UPON THE WATERS

It is an easy journey from England to Russia, either by land or sea. One of the chief routes by land is *via* Berlin and Warsaw, taking about three days. If we choose to go by sea, it will take a little longer, even if we shorten it by going through the Kiel Canal, instead of round Denmark to the Baltic, then up the Gulf of Finland, past Kronstadt, the great arsenal and sentinel of the Neva, to the city of Peter the Great, the capital of the empire, built on the islands and shores of the Neva, as it winds into the Gulf of Finland.

If we mount the dome of St. Isaac's Cathedral, near the centre of St. Petersburg, and look down on the mass of glittering water in the canals and arms of the Neva, the city seems as if almost floating upon it. The edges are lined with fine quays and docks; and barges and steamers and boats of all kinds ply busily about in every direction, for St. Petersburg is connected by water with the distant Black, White, and Caspian seas. But if our visit is in winter, a very different scene meets our eyes. All is frozen—the Gulf of Finland, the rivers, the canals, and the lakes.

THE SLEIGHS WITH THE TINKLING BELLS THAT RUSH OVER THE FROZEN LAKES

The ice is strong enough to bear carriages of every description; and rich folk, wrapped up to the eyes in costly furs, glide swiftly along in sleighs, sometimes with three horses abreast, tinkling their bells, over the ice and snow, to enjoy all the balls and theatres and parties of the gay winter season. French is greatly spoken by the upper classes in Russia, as other Europeans find it very difficult to learn to speak the Russian language. Between St. Isaac's and the Neva is the statue of the founder of the city,

THE PEOPLE OF EUROPEAN RUSSIA

Here is a Russian gipsy girl. There are fewer gipsies in Russia than other countries.

These are peasant girls of Little Russia, that part of the Russian Empire in Europe that includes the important town and province of Kiev.

This moujik, or peasant, girl belongs to the province of Tver, to the north of Moscow.

The great mass of the people of Russia are very poor, their despotic and selfish Government grinding enormous sums from them in the way of taxes, a great proportion of which is wasted or embezzled. The poverty of the people can be seen from this picture of Russian road-menders at their work, the men having to use rags instead of shoes.

The people of the Baltic provinces are more intelligent than other Russians, owing to their contact with the rest of Europe. Their character and dress may be seen from this picture of an Esthonian girl.

Peasant girls of Lithuania, the country that was formerly included in the ancient kingdom of Poland, but is now known as Western Russia. The girls are shown in the picturesque costume in which they usually work.

with the English quay on one side and the Admiralty buildings on the other. From the Admiralty the three chief streets, or prospects, radiate in straight lines. The Nevski Prospect, like the Unter den Linden of Berlin, is one of the finest streets in Europe. The Kazan Cathedral is in it; and at its end is one of the most celebrated monasteries in Russia—that of St. Alexander Nevski.

THE WONDERFUL CHURCHES OF RUSSIA, COVERED WITH GOLD AND JEWELS

It is difficult for us, who are used to plainer houses of worship, to realise the exceeding richness of the decorations in Russian cathedrals and churches. Not only are they adorned with marbles, agates, jasper, green malachite, blue lapis lazuli, and fine work in gold and silver, but there are many sacred pictures, often set with diamonds and other precious stones, and beautiful embroidered hangings, and many other works of art. The services held in these magnificent churches are very grand and solemn.

Next to the Admiralty is the famous Winter Palace, joined to the Hermitage, built by Catherine the Great, and beyond that is the Summer Garden and Palace. In these palaces are stored treasures of pictures, painted by the greatest artists of the world, and also most valuable and interesting collections which illustrate every part of Russian history. The Crown jewels of Russia are kept in the Winter Palace, and form a most gorgeous display; enormous diamonds, and rare rubies and sapphires blazing from crowns and necklaces and sceptres.

The Royal Library, in the Hermitage, contains more than a million books, besides an important collection of manuscripts. Among them are letters from Mary Stuart, Henry VIII., Elizabeth, and Charles I.; and there is a writing exercise of Louis XIV. in French, "Homage is the right of kings; they do what pleases them." No wonder the boy grew up to declare proudly, "I am the State."

THE SIMPLE COTTAGE OF RUSSIA'S GREATEST RULER

Just opposite these palaces, across the Neva, is the fortress and cathedral of St. Peter and St. Paul, where all, save one, of the sovereigns of Russia since the foundation of St. Petersburg have been buried. Peter's boat, "the grandfather of the Russian Navy," in which he sailed about and gained much practical skill, is housed near the cathedral. Close by is the interesting cottage where "the giant wonder worker," as Peter was called, lived on the banks of the river while superintending the building of his city. Two rooms and a kitchen were all he required.

In the Artillery Museum is Peter's carriage with which he measured roads, the number of revolutions made by the wheels being registered by the machinery in the box behind—a sort of taxi-cab. On the lid of the box is a picture of Peter travelling, with forests in front of him, and newly built houses and newly laid-out gardens behind him.

There are many manufactories round St. Petersburg, which also has a large trade, chiefly in produce—timber, tar, hemp, sugar, and beetroot—from the forests and plains close by. Alongside the quays many English and German ships may be seen in the process of loading.

MOSCOW, THE CITY OF GILDED SPIRES AND PAINTED DOMES

We could spend months in St. Petersburg and not come to the end of all the treasures to be seen in it—treasures from which we can learn much of the story of Russia and its peoples without opening a book; but the whole country lies behind it, and we must hasten on to Moscow, the ancient capital, 400 miles south-east of St. Petersburg. Moscow is now the centre of the railway system of Russia, though the old water routes which connect it with distant parts are still much used.

Over a million people live in both St. Petersburg and Moscow. The older city is the centre of a great cotton trade, and there is a large coal-field in the neighbourhood.

South of the city, where the Moskva river makes a great loop, are the Sparrow Hills. It was from here that Napoleon, surrounded by his staff, surveyed the glittering city at his feet. Thousands of housetops, and trees, and the winding river lie before us, but above all stand out the gilded and coloured domes of the cathedrals and churches and the grim walls of the numerous monasteries. We have already glanced at the history of this bustling and busy city, and now we must visit the Kremlin,

THE OLD AND NEW CAPITALS OF RUSSIA

In this view of Moscow we see the cathedral of St. Basil, one of the strangest buildings in the world. It has twenty gilded domes and towers, all of different shapes and sizes, and has been called "a nightmare in stone." This curious style of architecture is distinctly Russian, and similar churches are dotted all over the Czar's empire.

St. Petersburg was built by Peter the Great, who drained the marshes of the River Neva by cutting canals, and so provided solid ground for the foundations of his new capital. Here we see the Nevski Prospect, the finest street in St. Petersburg. It is three miles long and very wide, and is lined with magnificent shops and public buildings.

which is the Tartar name for a fortress. The Kremlin itself consists of a mass of buildings on the higher bank of the Moskva River, shut in by a wall, with towers and gates. It is, to Russians, one of the most sacred spots, for here are the Synod buildings, where the Council of the Russian Church meets in solemn state. Here are the ancient garments, some richly embroidered with pearls and precious stones, and the jewel'ed mitres worn by the patriarchs of the Eastern Church. Here, too, in the Cathedral of the Annunciation, the czars have been baptised and married, and in the Cathedral of the Assumption all the czars from Ivan the Terrible have been crowned; in the Cathedral of the Archangel Michael, the old czars were buried.

Many and greatly revered are the relics and sacred pictures called ikons, and treasures of jewels and gold and silver, to be found in the various buildings of the Kremlin. In the Tower of Ivan the Great are the famous bells which are rung on Easter Eve with such wonderful effect. The enormous "King of Bells," which is 19 feet high and weighs 198 tons, stands at the foot of the tower, with a piece knocked out of its side weighing eleven tons.

THE WEB OF STREETS THAT HAS BEEN SPUN AROUND THE SACRED KREMLIN

All round the Kremlin lie streets arranged like a spider's web, and there are many rich monasteries and great churches and fine houses, and beyond are the factories of all kinds and the hovels of the workers.

It is easy now to pass by train to Kiev on the Dnieper, the mother of Russian towns, and, indeed, one of the most ancient towns in Europe. It has many fine old cathedrals, and also important trade and manufactures. Its companion, Novgorod the Great, near Lake Ilmen, called the cradle of the Russian Empire, bears many marks of its ancient and important history, dating from the times of the Scandinavian Rurik. Here, in 1862, a monument was erected to commemorate the 1,000th birthday of the Russian Empire.

Nijni, or Lower, Novgorod, on the Volga, is also a place of much interest, chiefly on account of the great fair which is held there every summer. It is said that the value of the goods brought to the fair for sale amounts to about $120,000,000 sterling; shops and bazaars, and all sorts of buildings cover a large space of ground, and the wares set out in them come from every part of the empire and beyond. There are iron goods from Tula, near Moscow, the Russian Birmingham and Sheffield combined; silks from Persia; precious stones and furs from Siberia and Central Asia; tea from China; rich carpets, dried fruits, cotton goods, silver ornaments, and all sorts of wooden boxes and toys made by the peasants.

HOW EAST MEETS WEST IN THE CITY OF THE GREAT FAIR

The wharves of Nijni Novgorod, where most of this merchandise is unloaded by sturdy Tartar labourers, are quite ten miles in length; and the various types of people seen selling, buying, and looking on, show that here Europe and Asia meet and trade.

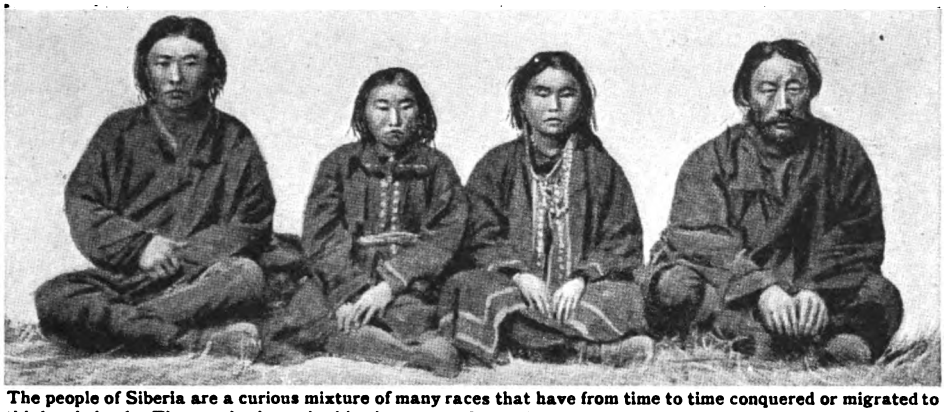
Steamers ply regularly on the great rivers, such as the Volga, now a peaceful highway of commerce with numbers of towns on its banks, and united with the distant seas by its tributaries and connecting canals. Its course approaches to within forty miles of the Don. Many are the stories of fierce warfare and pirates connected with the great rivers of South Russia in the past. Astrakhan is the port near its delta in the Caspian Sea, the headquarters of the large fishing industry carried on in that inland sea.

Odessa, on the Black Sea, is the great port of the South for sending away the corn grown in the fertile parts of Little Russia. Many of the ships along the quays at Odessa fly the British flag. Wool is exported from the steppes round the Black Sea, and there are many engineering and shipbuilding works in the neighbourhood of this thriving city.

A MIGHTY MOUNTAIN, AND A SPLENDID ROAD ABOVE THE CLOUDS

Railways now run down from Moscow and other parts of Russia to the Caspian Sea, skirting the eastern edge of the Caucasus Mountains, which form such a high barrier between North and South. The highest peak, Mount Elbruz, tops Mont Blanc by about 3,000 feet. There is a splendid military road over the Dariel Pass, rising at parts into the clouds, with scenery like that of Switzerland. White peaks against the

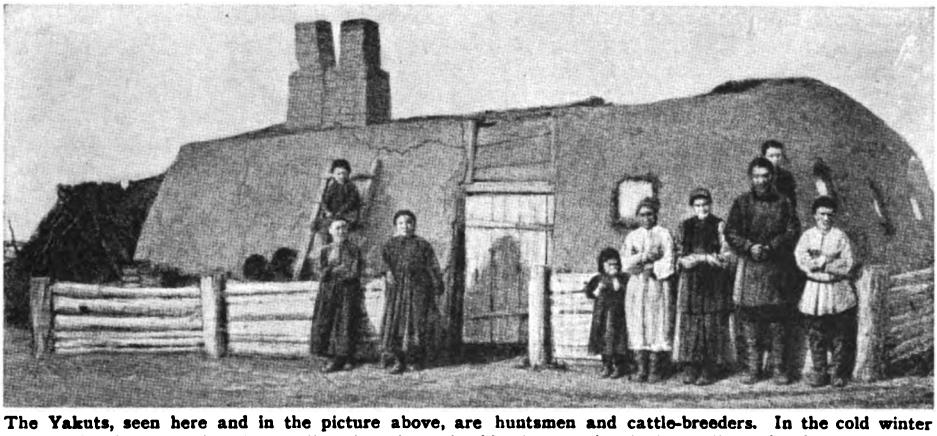
THE STRANGE PEOPLE OF LONELY SIBERIA



The people of Siberia are a curious mixture of many races that have from time to time conquered or migrated to this lonely land. The people shown in this picture are Tungusians, a race that lived originally in Manchuria, but wandered south, and east, and north into Siberia, their character largely influencing the peoples they conquered.

The Yakuts, shown here in winter costume, are another race that went into Siberia from the south. They are more hardy and industrious than the Tungusians, through whose territory they fiercely fought their way.

Another Siberian race is that of the Giliaks, who live in the Amur valley. They are a very ancient race, and are related to the Ainos, the early inhabitants of Japan. In this picture we see a Giliak woman with her child.



The Yakuts, seen here and in the picture above, are huntsmen and cattle-breeders. In the cold winter months they live in curious houses like that shown in this picture, with sloping walls made of wood, covered with clay, the roofs being of clay and peat. In summer they live a good deal in tents and in the open air.

blue sky, dashing torrents, glaciers and avalanches, all seem especially beautiful after the bare steppes and rocky deserts that are found not far off. Baku, on the Caspian Sea, famous for its rich mineral oil wells, is connected by the line that runs through Tiflis with the port of Batoum on the Black Sea.

RIVERS OF OIL THAT RUN THROUGH PIPES SIX HUNDRED MILES LONG

There are special boats and trains to convey this never-failing oil from the wells whence it springs, but, in addition, pipes are now laid, through which pour daily over a million gallons of oil, straight to the tank-boats and reservoirs at Batoum about 600 miles away.

The rail now pushes on beyond the Caspian Sea, and links together the fertile oases which lie like green islands in a sea of sand, watered by rivers which afterwards lose themselves in the surrounding dry and rocky soil. In these oases, rice, wheat, and fruits are grown. Here, in Russian Turkestan, most of the people are Mohammedans, and numbers lead a wandering life, keeping camels, cattle, sheep and horses wherever sufficient pasture can be found on the dry and barren steppe lands.

But the greatest achievement in linking together the far distant parts of the great empire by means of the iron rails is the Siberian Railway, from Moscow right across Asia to the Sea of Japan, an arm of the Pacific Ocean.

This railway reminds us, in some ways, of those that run across America. It is longer, and much of the scenery is dreary and flat, and often it runs through endless forests. It crosses over the Ural Mountains near Ufa, a district famed for iron mines and foundries, as well as for its riches in gold and precious stones.

THE LONGEST AND MOST MARVELLOUS RAILWAY IN THE WORLD

There are no tunnels, and there is none of the exciting, hair-breadth travel that the great lines of the North-west furnish among the Rocky Mountains. In winter it is so cold on the Siberian line that meat, butter and fish need no refrigerating cars. The water for the engines has to be brought hot, or it would freeze on the way.

A great feature of this line is the number of bridges needed. One that crosses the Volga near Samara is nearly a mile long, and many more are passed on the way through West and East Siberia, crossing over the immense rivers that drain so slowly and quietly across Siberia from the South to the frozen Arctic Sea. The Obi, the Lena, and the Yenisei are all, like the Volga, over 2,000 miles long; so is the Amur, which flows east to the Sea of Japan; and many of the tributaries which join the Arctic rivers are long and important, and have helped much in the development of the country. In West Siberia the railway runs through a belt of very fertile black earth, like that in Little Russia, where wheat is grown, and immense dairy farms are rapidly developing.

Thousands of settlers from other parts of Russia are brought every year by train to fill up the vast silent tracts of Siberia. The line runs past Omsk and near Tomsk, past Irkutsk, round the south of Lake Baikal—a most difficult piece of engineering; then onwards through Manchuria, which belongs to China, to Vladivostock, with some branch lines.

THE MONSTERS OF A PAST AGE WHOSE BODIES ARE PRESERVED TO-DAY

Many towns are growing up on the line, both trade centres and mining towns. Omsk is the centre of the agricultural industry of Siberia. At Irkutsk, the largest town in Siberia, are gold-smelting works, besides other industries, and a university.

The coldest place in the world is on the River Lena, where the difference in the winter and summer temperatures is the greatest known. There are islands in the Pacific where the temperature is almost the same all the year round.

At the mouth of the Lena, and in other parts of the Arctic shores, the remains have been discovered of mammoths with long, woolly hair, frozen hard in the icy mud by which they were suddenly overwhelmed ages ago. Their flesh, when first exposed, was actually eaten by the wild animals prowling around. Some of the monsters have been preserved and set up in various museums, and interesting photographs have been taken of these creatures, so miraculously kept for centuries after all their kind had disappeared from the earth.

There is a large trade in ivory from the tusks of these prehistoric animals found in the New Siberian Islands, which lie off the mouth of the Lena.

It now takes about eleven days to travel the 5,000 miles between Moscow and Vladivostock, and the last part of the line is full of reminders of the dreadful war between the Russians and Japanese in 1905, when Russian soldiers were brought across Asia by thousands on the Siberian Railway, to perish miserably in the struggle. The Russian Navy was practically destroyed near Port Arthur on the Yellow Sea.

Many strange-looking people are seen at the stations along the Siberian line—Chinese, Mongols, Russian emigrants, and wild people of the steppes. Some of these join the Siberian line, where it crosses the Urals, from the railway that runs through Orenburg, on the Ural River, from Tashkent, beyond the Sea of Aral, which, again, is joined to the Trans-Caspian line. Much trade with Central Asia comes this way.

The Urals run for over 1,000 miles to the Arctic shores, and form a great storehouse of mineral riches. Dreary plains of snow and ice in winter, and damp swamps in summer, lie between them and Archangel, on the White Sea, which for long was Russia's only port.

AN ICE-BOUND HARBOUR THAT WAS AT ONE TIME RUSSIA'S ONLY PORT

It is now connected by rail with St. Petersburg, and, in spite of its remoteness and the ice which closes its harbour for so many months in the year, vessels still trade there for oats, tar, and lumber. Peter the Great took much interest in developing this port. He built a quay and a fortress some miles off. The cottage in which he lived is still shown; also two of his boats, one built in England.

It is easy to reach Finland from St. Petersburg; and many visitors are attracted there to fish, and boat, and bathe, for the clear lakes are delightful, and the scenery, with its woods and streams, is very pretty. There is enough fall in many of the streams to give water-power for various purposes, such as sawing and wood-pulping, and the towns are numerous and interesting, and most of them are full of reminders of Swedish days. Helsingfors, the capital, was founded by Gustavus Vasa in the sixteenth century, and it has a Senate House and a university. Abo is a busy place, with much trade, and has an interesting cathedral, dedicated to the English St. Henry. The Finlanders are highly educated, and are deeply interested in reforms and good government, and in finding out the best ways of living. Finland is one of the countries where women are counted as citizens, and are allowed to help to choose the representatives who settle public matters, as well as men. They can even be elected as representatives themselves.

HOW THE AUTOCRAT OF ALL THE RUSSIAS MAINTAINS HIS CRUEL TYRANNY

The reins of the government of the vast empire are held in St. Petersburg. Here the Czar lives, the autocrat, the holder of supreme power, whose will is law, and who is practically above the State Council, the Duma, elected to represent the different governments, provinces, and chief towns. There are other councils, too, part of a machinery that many think out of date, whose members are chiefly men of high rank; and an enormous number of officials, governors, and those under them, besides police and spies, always needed in countries that are not free; also thousands of soldiers spread over the great provinces, not only to defend or extend the borders of the empire, but to repress the risings of those who live within it.

It is generally but a stifled whisper of the struggle going on in Russia that reaches the ears of Europe. Millions in the vast empire still live on in blind obedience and submission to the Czar, whom they look upon as a God-sent father. But there are also millions who desire with all their hearts to gain for their beloved country the blessings of a free government, such as are the birthright of American citizens. Denied free speech, free writing, even free reading—for officials black out what they consider harmful—Russian reformers band themselves into secret societies that spread like a network over the country, in which to plan and discuss how they can best attain their ends.

THE BITTER STRUGGLE FOR FREEDOM THAT IS NOW GOING ON IN RUSSIA

These societies make it their business to teach the great masses of the people, many of whom cannot read or write, that they may have the right, as human beings, to lead decent, well-ordered, and self-governed lives.

But, occasionally, it is more than a murmur of this seething discontent that we hear. Sometimes the people

burst out into open revolt. From time to time America is startled and horrified by the news of assassinations of the leaders of the government, by men banded together to destroy the existing state of things in the swiftest way they can devise.

It is one of the chief objects of the government of the Czar to detect and defeat all the efforts made for freedom. So spies and police are sent in every direction to people's homes, to the universities, even to debating and Shakespearian societies; and on bare suspicion men and women and mere children are seized, put in prison without trial, and sent away to dreary exile or bitter death. In some cases their sorrowing friends never know their fate.

Is it any wonder that this unjust violence—and we cannot tell the half of it—has called out mad, unreasoning violence to meet it, and caused many desperate deeds? But, mercifully, all reformers in Russia do not believe in using bombs to gain their righteous demands. Many go on in patience, teaching and preparing the ground for the final struggle and the success that must come sooner or later.

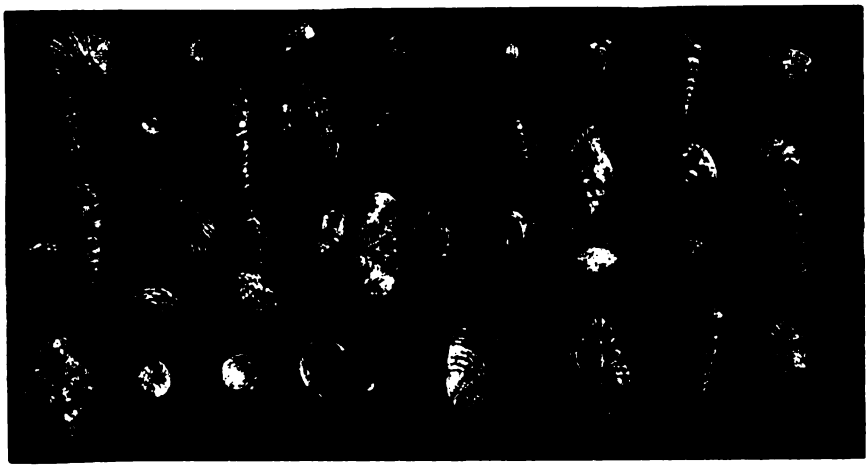
The greatest leader of thought in Russia, as well as the greatest influence for gaining freedom by peaceful methods, was Count Leo Tolstoy, who died in 1910. He lived in the very heart of Russia, not very far from Moscow. Until the end of his life this old man of more than eighty, with long white beard and piercing eyes, wore a peasant's smock and led the life of a peasant. He feared no one, not even the Czar.

And yet many have been imprisoned for only possessing the books which he wrote and published for the whole world to read. Some of these books give beautiful, if sad, pictures of the peasants he loved so well—the peasants whose lives he shared, though he was born a rich man—and of the attempts he has made to educate them. Others, again, show in burning words the terrible wrongs suffered by Russian reformers at the hands of spies, police, and governors. His voice, too, rings clear and loud as he denounces the wrongs of the peasants, the evils of luxury, the hollowness of the state religion, the wickedness and waste of drawing men from their homes to train them to kill their fellow-men.

And no one dared to touch Tolstoy as he uttered his brave and inspiring words, standing out boldly against the dark background of Russian misery.

THIS MAP SHOWS THE RUSSIAN EMPIRE IN ASIA, WITH ITS VAST PLAINS AND MIGHTY RIVERS

The next story of Countries is on page 3873.



WHERE DO SHELLS COME FROM?

CONTINUED FROM 3695

THE shells in the sea are the little houses that living creatures have made for themselves from their own outsides. The sea is crammed with life from the surface to the bottom, and from its edge on the shore to its centre. A very large number of the living creatures in the sea make shells for themselves, partly to protect them from the fishes, that would like to eat them, and partly to protect them from the force of the water.

We call these creatures shell-fish, but the name is a very bad one. No fish makes a shell, and these creatures are not fishes at all, but far lower in the scale of life. A fish is an animal that has a backbone and a skeleton that lies inside its body. The bodies of the creatures that produce the shells of the sea are soft, and have neither a backbone nor any other bones.

These kinds of creatures existed in the sea long before the fishes were evolved at all. When they die, their bodies are gradually dissolved away, but the empty shell that was made by them remains. It is now much lighter than it was, for its inhabitant is not there to fix it to a rock or a seaweed, and so it is cast up by the waves on the shore, where we find it. Sometimes, when we dig far inland, we come across many sea-shells deep down in the earth. These shells prove to us that at one time, long, long ago, the sea used to cover that place. As the little creatures died, their shells dropped to the bed of the sea and were gradually covered by layer upon layer of mud, until that which was previously the sea-bed at length became dry land.

HOW CAN WE TELL WHAT IS AT THE BOTTOM OF THE SEA?

We do not yet know all about the bottom of the sea, but there are several ways in which we can learn something of it. We can comfortably study a great deal of what was once at the bottom of the sea, when the sea has gone somewhere else, and has left it high and dry. For instance, we can study chalk cliffs, and learn from them a great deal about what the bottom of the sea is like, or has been like.

Then we can send divers down to the bottom of the sea where it is not very deep, and they can look through the glass plates in their diving-helmets, and can see the plants and animals of many kinds that live at the bottom of the sea. They can bring some of these up, and at the New York Aquarium we can see for ourselves, at close

quarters, many of the wonderful creatures that live at the bottom of the blue sea, such as sea-anemones.

But divers cannot go down many scores of feet, and the sea is often miles deep. If we want to learn about the deeper parts of the sea, we must dredge them—that is, let down something that will scrape along the bottom, and catch hold of anything that will come away; and then the catch can be hauled up to the surface, and we can study it. This is costly, and takes time, but much of it has been done, and we have already learnt a great deal about the bottom of the sea by this means.

WHAT MAKES WATER GURGLE WHEN IT COMES OUT OF A BOTTLE?

We know that the air has a pressure, and so, if there is an empty space anywhere, the air will press into it. Now, when we pour water out of a bottle which is full, there must be an empty space left behind in the bottle when the liquid comes out, and from moment to moment, as that empty space tends to be formed in the bottle, the air outside is bound to rush in to take its place. If the bottle has a wide mouth, like a tumbler, then, as we pour the liquid out, air can flow in evenly, and there is no gurgling.

But if we take a full ginger-ale bottle, and hold it upside down, then there is a series of fights going on between the liquid, which is trying to get out under the pull of gravitation, and the air, which is trying to push its way past the liquid to fill up the space in the bottle. Sometimes the air pushes back the ginger-ale, and sometimes the ginger-ale pushes back the air. This means that the air is thrown into little disturbances, which we hear as gurgles. We say that water gurgles, but really, of course, it is the air that is disturbed by this contest between it and the water, and we call these disturbances "gurgles."

WHY DO EMPTY VESSELS MAKE MORE SOUND THAN FULL ONES?

In the study of sound we soon discover the existence of things which help to magnify a sound. The virtue of these things is that they resound, and so they are called *resonators*. The body of a violin is a resonator, and so are our chests and the spaces of the mouth and nose when we sing. If we play a violin from which the body has been taken away, the sound is weak, and thin, and ugly, and the difference between a violin worth $10,000 and one that is not worth $25 is to be found in the body, or resonator. The whole point about a resonator is that the air inside it can be thrown by it into sound-waves. If there is no air inside it, of course its use is gone. An empty vessel is a resonator. If it is filled with fluid, it can no longer act; it makes far less sound, and the weight of the fluid quickly stops what sound it does make, acting like the dampers in a piano. If we were to fill the body of a violin with water, we should get the same result as if we held the body of the violin tightly in our hand when playing it.

WHY, IF WE TOUCH A GONG, DOES THE SOUND CEASE?

The sound of the gong, like all other sounds, is due to waves of air that strike against the little drum inside our ears and are translated by the nerves of hearing into what we call sounds. These waves in the air are made by something. In the case of a gong or the string of a piano, they are made by a vibration which has been produced by striking the gong or the string. When we play a note on the piano, a hammer strikes a string; if we let go the note, the sound stops. It stops for exactly the same reason as the sound of the gong stops.

When we touch a gong, we stop its vibrations, and therefore we stop the movements of the air which those vibrations were causing. If we are doubtful as to what a vibration really is, we only have to touch the gong gently after striking it, and we shall understand. In the case of the piano, when we let go the note we have just played, the sound ceases at once, because the damper, as it is called, which was raised from the string when we played the note, is allowed to fall on it again, and damps the vibrations. We do exactly the same when we have accidentally struck a tumbler and set it ringing; if we handle it, it stops.

WHY CANNOT WE FEEL AIR-WAVES WITH OUR HANDS?

This is simply a question of the delicacy of the sense of touch. Our hands can and do feel air-waves of certain rates and sizes. When we fan

ourselves, we feel air-waves, and we also feel them when someone suddenly shuts a door, or when we stand on a station platform and an express train whizzes by. But when the air-waves are very much smaller and quicker, we cannot feel them with our hands, but we feel them with our ears, and then we call them sounds. Some of the very largest and slowest air-waves that can just be heard by our ears, as a very deep, faint, low sort of boom, can also be just felt by our hands. This, of course, depends upon the limits of hearing in the person in question, for some people can hear much lower notes—that is to say, much slower waves—than others.

WHY CAN IRON FLOAT ON MERCURY IF IT CANNOT FLOAT ON WATER?

All questions of floating and swimming and flying depend on the comparative differences between various things as regards gravitation. Iron is heavier than water, or, as we say, its specific gravity is greater than that of water. Iron must therefore sink in water. Mercury is heavier than water, and therefore mercury must sink in water. But mercury is heavier than iron, and it must therefore sink in iron, which is just a peculiar way of saying that the iron must float on the mercury. The thing with the highest specific gravity is the thing for which the earth has the strongest pull. It therefore gets nearest to the earth, and anything else must float on the top of it.

WHY CAN IRON BE BENT WHEN HEATED?

We all know that things vary very much in the way they behave when something tries to alter their shape. Some things will rather break than bend; others will bend and then come back again to their old shape; yet others will bend and stay in the new shape, even when the bending force is removed. Various special names are applied to these different properties of matter. A general rule that applies almost always is that the colder a thing is, the more rigid it is. This applies even to the three great states of matter, solid, liquid, and gaseous, for it is only in the coldest of these—which is the solid state—that things can have any rigidity at all, and, as a rule, the colder a solid thing is, the more rigid it becomes. This, as the question suggests, is true of iron. We believe that when a thing is made hot, the molecules of it are thrown into a state of greater motion, and we know that they are farther apart, for the thing expands. But if the molecules are farther apart than they were, and if they are moving about more violently than they were, they cannot be holding on to each other so tightly and rigidly as before, and so the thing which, when it was cold, could not be bent, can now be bent. Directly we understand the nature of heat, we see how reasonable it is that iron should behave as it does.

WHY IS COAL THE BEST THING FOR MAKING A FIRE?

We ought not to say that coal is quite the best of all possible things to burn for making heat. The best fuel is really hydrogen; in other words, we get more heat by burning a given quantity of hydrogen than by burning the same quantity of any other substance that we know. That is why we burn a mixture of oxygen and hydrogen when we want to heat a piece of lime to make the light in a magic lantern. Of course, the objection to using hydrogen is the very great expense.

The advantages of coal are its cheapness, its dryness, and especially the fact that such a large proportion of it is burnable. Coal itself contains a good deal of hydrogen, and is good so far; but the carbon of which it mainly consists is itself a fuel which is scarcely inferior to hydrogen, and as there is practically no water in coal—except, of course, the water that is made when the hydrogen of it is burnt—we benefit by the heat that is made; whereas, if the coal had had a good deal of water inside it, that water, as water always does, would catch up the heat, and we should lose it. All the same, the time is rapidly approaching when we shall produce heat in vastly better ways than the burning of crude coal in open grates.

WHY DOES SMOKE ALWAYS COME FROM A FIRE?

There is no real reason why smoke should always come from a fire, and already there are many ways of making fires which produce no smoke. The time is not very far off when no one will be allowed to make fires that produce smoke. The reason why smoke comes from our ordinary fires is the same as the reason for a great many

other facts that we can notice. It is, indeed, the reason which explains the making of the coal in the first place. Carbon will not burn unless it is hot enough, and it is less easily burnt than most of the other things that can burn. So a certain quantity of carbon is apt to go unburnt, though this will happen far less if we keep the fire hot enough, which is to be done by giving it a good supply of air. If we make a forced draught, and keep up a steady, quick flow of fresh air—that is to say, of fresh oxygen—to the fire, then we shall find that all the carbon is burnt up, and no smoke will be produced. Smoke is always a sign of failure and waste, even if there were nothing worse to say about its consequences.

WHY IS THE FIRE HOT?

The heat that we feel when we stand opposite a fire is of two kinds. Partly, it is the heat in the air which the fire has made warm, and which we feel against the skin. That heat has flowed into the air from the hot fire, but by far the greater part of the heat we feel opposite the fire is what is called radiant heat, a thing which is exactly of the same nature as light, only that instead of *seeing* it we *feel it hot*. So our question is: What happens in the fire that makes it produce the heat of both kinds that we feel? It will be quite plain to us that when heat is being produced something is being done, something is being made, and we know that the power has to come from somewhere. It comes from the carbon in the coal and the oxygen in the air.

They have energy and power locked up in them which are, so to speak, released when the carbon and oxygen combine to make the fire. The proper way of saying this, as we read on page 3552, is that the potential energy of the carbon and oxygen are changed, when they combine, into heat energy. This heat shows itself in a rapid motion, we suppose, of the matter in the fire. This communicates itself to the atoms of the air, making them hot, and it also starts the waves in the ether which we call radiant heat.

WHY DOES STEAM PUT A LIGHT OUT?

Of course, it depends upon the kind of light whether steam will or will not put it out, but it is certainly true, as we all know, that a fire or a lighted gas-jet or a lamp may be put out by steam. For this there are at least two reasons. We use the word steam rather loosely, often meaning by it liquid water in the air—the steam that we can see. But sometimes we mean by it water-vapour. Wherever there is steam, there is water-vapour—that is to say, water in the air in the form of an invisible gas. Now, this water is already burnt; it can neither be burnt any more, nor can it sustain the burning of anything else.

In so far as the thing which produces the light is supplied with water-vapour in the air instead of oxygen, it is starved and must go out. But the presence of steam means also the presence of liquid water, and liquid water puts a light out because it so quickly swallows up into itself the heat which is near it, and makes the burning thing so cold that it cannot burn. Every man who smokes a pipe knows the great difference there is between smoking moist tobacco and dry tobacco.

WHY DOES NOT THE COLOUR COME OFF SOAP?

We often notice that the colour comes off things, and the reason, of course, is that the colour is only on the surface, and if the surface is scraped, or rubbed, or worn away, the colour goes with it. But many things are coloured, though they are not painted. We might say why does not the colour come off a brass fender, or off a silver spoon, or off a gold ring? The colour does not come off in these cases for the same reason that explains why it does not come off soap. The soap, like the fender or the silver spoon or the gold ring, is made throughout of coloured material.

IS THERE A COLOUR THAT OUR EYES CANNOT SEE?

It is our brains that translate into colour something outside them which we call waves of light. If there were no brains, those rays of light would still exist, but, plainly, it would not be proper to say that they were colours. Now, what happens in the case of light is that, if we compare all the possible kinds of light to the notes on a piano, there is just about one octave in that large compass that our eyes can see. The notes above and below that octave are in all real particulars of the same kind, but our eyes cannot see them.

THE WONDER AND BEAUTY OF SEA-SHELLS

The poets have sung of "the rainbow-tinted shell," with its colours of sky and flower and gem and plant. But the hues of the shells are not more wonderful than their myriad shapes, with whorl and spire and scroll, which Tennyson calls "a miracle of design," and which sculptors and artists have copied again and again.

If our eyes could see them, they would certainly be of different colours to the light that we can see. The notes below the red end of the octave that we can see would appear as some other colour which, of course, we cannot imagine; and the notes above the violet end of the octave we can see would appear as another colour. It has been clearly proved that some insects, such as ants, can see these rays of light beyond the violet, to which our eyes are blind. But what colour it looks like to them, of course, no human being can ever tell. It is very interesting to know, however, that there are animals which can see notes of light which we cannot see, just as there are animals which can hear notes of sound too shrill for our ears to hear.

WHY DOES A DIVER NEED LEAD ON HIS BOOTS TO MAKE HIM SINK?

The diver would certainly sink without the lead on his boots. His body itself is heavier than water, and though the small quantity of air between himself and his case tends to make him float, yet the metal round his head makes him heavier still. The point about the lead on his boots is that it makes him sink in the right direction. If it were not for that he might sink head first or sideways, and might find it exceedingly difficult or impossible to right himself. The lead serves, in a way, the same purpose as a piece of lead placed at the bottom of those little toys which cannot be upset, however much they are pushed about. A closer parallel still is the case of the balloon, which is kept the right way up by having its heaviest part below.

WHY IS SALT DAMP WHEN IT IS GOING TO RAIN?

When we say that the salt is damp, we mean that it has taken a lot of water into itself, and of course it has absorbed the water from the air. Common salt, like a host of other things, will help itself to the water in the air, though many other salts will do so far more readily than common salt does. We are speaking, of course, of water that was in the form of gas, making up one of the gases in the air. Plainly, the reason why salt becomes damp before it rains is that before it rains there is an unusual amount of water-vapour in the air. Indeed, the rain is due to the fact that the water-vapour in the air has become too great in amount for the air to hold it any longer, and so down it tumbles in the form of rain. When raindrops form, we know that the water-vapour of the air condenses in little drops around particles of dust, and so on, in the air. Well, that is exactly what happens when the salt becomes damp. The water-vapour in the air has condensed upon the particles of salt.

WHY DOES THE SUN MAKE OUR HANDS AND FACES BROWN?

For a long time the answer to this question was very uncertain. Doctors used to have the idea that every change produced in the body out of the ordinary was a disease—was something wrong. But a great many of these things that are too often looked upon as diseases, or as something wrong, are really instances of the marvellous powe: of the body to adapt itself to special circumstances. In this case, for instance, it used to be thought that some injury was done by the browning of the skin.

What really happens is that the skin turns brown in order to protect the blood underneath it from the too strong rays of the sun. The brown paint, or pigment, as it is called, that is formed in the skin catches up the sun's rays and absorbs them, and so the precious blood that runs in thin-walled blood-vessels just under the skin is protected.

Sunlight is exceedingly good and necessary for us, but there is only a certain intensity of it that is good, and beyond that it becomes harmful. People vary very much in the extent to which they brown under the sun. It is said that the people who can live best in the tropics are those in whom the skin has the best power of making the brown pigment to protect the body. It may be that the deep colour of dark races is protective, and that is why we find darker peoples nearer the tropics and fairer peoples nearer the Poles.

WHY DOES THE SURFACE OF WATER NEVER CURVE OR SLANT?

Water, like everything else, is under the influence of gravitation. All the parts of it must therefore get as near as possible to the centre of the earth. In the case of a solid thing, those forces which hold it together partly oppose the force of gravitation, and so an india-rubber ball, for instance, will remain as a ball, though if it were melted it would

run flat out on the table as water would. But when we come to consider what the shape of the earth is, we shall see that our question is not quite right if we are to read it strictly. The earth is a ball, and if water is to obey the law of gravitation and get as near the centre of the earth as possible, it follows that the surface of water must always curve, and its curvature, as we say, must be the same as the curvature of the earth.

The water in the smallest pool or basin must obey this law, but, of course, the curve is so slight that we cannot see it. If, however, instead of a pool we take a huge lake or the ocean, we can see that the surface of the water is curved for ourselves, because we can see how a ship leaving us falls round the corner, or a ship coming over the horizon rises up as it approaches us. So the real answer to this question is that the surface of water is *always* curved; and it is always curved in one way—the way in which the earth is curved—and that is what the question really means.

WHY DOES NOT A NEEDLE GAIN WEIGHT WHEN MAGNETISED?

This question puzzles us because we have not clearly distinguished in our minds what weight really is and what it is not. All weight is a direct consequence of gravitation, and of nothing else. Were there no gravitation, there would be no such thing as weight. The power of gravitation entirely depends upon the amount of stuff that is concerned, or the mass of matter that is acted upon. In other words, the weight of a thing depends entirely upon its mass—the amount of matter in it. Everything goes to prove that nothing affects gravitation except this question of the amount of matter present.

If we take a needle and heat it or cool it, magnetise it or unmagnetise it, or do anything else to it, so long as we do not take away any of the matter from it or add any new matter to it, its weight remains the same. When we magnetise it, we endow it with a new power which is very strong and wonderful, and which, for instance, can be brought to bear in such a way that it will overpower the force of gravitation, and will thus enable the needle to lift ten times its own weight. But the weight of the needle itself absolutely depends upon its mass, and upon nothing else. Our bodies weigh just the same whether we hold a weight in our hands or not; the amount of stuff in our bodies is the same in either case. Of course, our bodies and the weight together weigh more than our bodies would alone, but that is a different thing.

DOES EACH PLANET HAVE A LAW OF GRAVITATION?

The law of gravitation is not a question of any planet or star. It is a universal law. It is equally and strictly true of every particle of matter everywhere, and applies strictly between that particle of matter and every other particle, whether near or far. For us on the earth, the most important kind of gravitation is the earth's gravitation; that is simply because the earth is so near. But a book, which rests on a table under the pull of the earth, is also being pulled towards the sun, and the moon, and every star in the sky. Only the earth, being near, has the advantage, and that is why it is the downward pull we know so well, and usually call gravitation.

In the case of any of the bodies of the heavens, this downward pull depends upon its mass. Thus, if we could exist on the surface of the sun, we should find the downward pull vastly greater than here; on Mars less than here; on the moon still less, and so on. But if we think this over, we shall see that it simply means that gravitation is true everywhere, and that it is not the best way of putting it to say that each planet has a law of gravitation.

WHY ARE THERE MORE STARS IN THE SKY SOME NIGHTS THAN OTHERS?

Of course, we know very well that there are not more stars in the sky some nights than others, but that it is a question of what we see. What really happens is that the state of the atmosphere differs very much at different times, quite apart from the presence of actual clouds. Even when there are no clouds anywhere, and all over the sky the brighter stars can be seen, the state of the air may be such—whether owing to the presence of a lot of dust high up in it, or to other causes—that the less bright stars cannot be seen. The temperature and the pressure of the air have their own effects in this respect. Much of the recent advance in astronomy has been due to the fact that

great new observatories, containing the finest telescopes in the world, have been specially built on the tops of mountains, or, at any rate, as high up as possible in parts of the world specially chosen for the clearness of the air; and the higher the telescope, of course, the less the amount of even clear air that the light from the stars has to pass through before it reaches the eye of the astronomer or the lens of the camera.

HOW CAN WE TELL HOW MANY DAYS THERE ARE IN A YEAR OF A PLANET?

If we know how long a planet takes to go once round the sun, then we know the length of its year. Then, if we can watch the planet, and see how long it takes to spin round once on itself, we know the length of its day. Divide the length of the year by the length of the day, and we have the number of days in the year. But though that is quite easy in some cases, in others, unfortunately, it is impossible, and so we cannot yet tell the number of days in a year of any planet. The trouble is that, though we know how long the planet takes to go round the sun, in some cases—as, for instance, in the case of Neptune—the planet is so far away that we cannot make out any of the features of its face, and therefore cannot tell at what rate it spins, or even that it spins at all, and we do not know the length of its day, though we do know the length of its year.

DO THINGS WEIGH HEAVIER OR LIGHTER WHEN HOT OR COLD?

This question about gravitation is really extremely interesting, because it so happens that this is one of the very questions on which a great many remarkable experiments have quite lately been made. There is no doubt about the answer to it, but we must understand what that answer really is. It is that the power of gravitation is not in the slightest degree affected by temperature; in other words, one and the same thing—if nothing is taken from it or added to it—weighs just the same, however much it is heated, or however much it is cooled. But we must not be confused. When a thing is heated it swells, as a rule, and as there is no more of it there, but it is occupying more space, it *is* made lighter *in proportion to the space it occupies*. Thus hot water will float on the top of cold water; hot air will rise in cold air, and so on. This, however, is not a question of absolute weight, but of the relation between that weight, *which is not changed*, and the volume of the thing.

DO EAR-RINGS AFFECT OUR EYES?

I do not know anything good that can be said of ear-rings, said the Wise Man; but, of course, we must not say any evil of them that is not true. It is utterly untrue that piercing the ears, with or without the wearing of ear-rings, has any effect at all upon the eyes. There is no reason whatever why it should have such an effect, and hundreds of thousands of cases every day prove, of course, that it has not. Perhaps, if we want to say the best we can for ear-rings, we must add that, at any rate, they do less harm than nose-rings, which are worn for the same reason—that is to say, for ornament—by many savages.

IF LIGHT IS A WAVE OF AIR, DOES THE LIGHT-WAVE GO THROUGH GLASS?

Light is *not* a wave of air; it is a wave in the ether, and this ether is everywhere—in the air and in the glass, too. When the light passes through glass, it is a wave in ether all the time, though during part of its journey the kind of matter called air is there, too, and in another part the kind of matter called glass is also there. This is not to say, of course, that matter has no effect on these ether-waves, for we know that it has. All we can say is that some kinds of matter offer no great obstacle to their passage, as, for instance, glass; while other kinds of matter, as, for instance, wood or stone, interfere very much with their passage. Sound *is* a wave of air, and where sound passes through glass, the air-wave on the outside throws the glass into a wave of the same kind, and the wave in the glass starts a new wave in the air on the other side, and so the sound goes on.

DOES AIR DISSOLVE IN WATER?

Certainly air dissolves in water, and the pleasant taste and sparkle of nice drinking-water are due to the air dissolved in it. If we are in some part of the country where we are not sure about the water, and fear there may be dangerous microbes in it, perhaps we boil it in order to kill them. When we boil it, we drive out the air which was dissolved in it, and if we keep up the

boiling for some time, we do this very completely. As it cools, the water dissolves a little more air in it again, but we shall still find it very flat and dull to drink. The thing to do is to pour it a long distance through the air from one vessel to another a few times, and then it will become sparkling and pleasant again. When we go on boiling the water we use for making tea or coffee, we spoil the beverage, because we drive out the air dissolved in the water. The water richest in air will, of course, be that in a shallow running stream, and that is the kind of water which was praised ages ago as the best for making tea with. If air did not dissolve in water, no life of any kind could exist in water.

IF THE EARTH IS A BALL, WHY DOES AN EARTHQUAKE SHAKE ONLY PART OF IT?

People who study these things have just been telling us that we really need two words for what happens in what we call earthquakes, and this question suggests exactly the point they make. We should really speak of *earth-quakes*, and of *earth-shakes*. In an earth-shake, the whole earth is shaken as it rolls through space, and this must happen because the earth is a ball, and we cannot shake part of a ball without shaking the whole of it.

But if the ball is a very big one, as the earth is, and if it is made of a great many different parts, including a crust of many layers, it is quite possible that we might have a disturbance somewhere that shook one of these layers against another, without shaking the ball as a whole; and that is the kind of disturbance that we should call an earthquake, and not an earth-shake.

DOES AN EARTHQUAKE TRAVEL THROUGH THE EARTH?

Even though what is stated in the last answer is true, a wave of disturbance would start from the place where the crust of the earth was moved, and that wave would travel through the earth.

That is what happens in every earthquake. Instruments are made that will show that an earthquake has occurred even thousands of miles away, by noting that a wave of shaking has travelled through the crust of the earth. So, in every case, our question is really answered by saying that, though a serious result may only happen at one place, where the earth's crust is disturbed, yet a wave of shaking always passes from that place right through the crust of the earth.

WHY CANNOT WE BREATHE UNDER WATER?

As we know, there is air dissolved in water, and it is this fact that enables creatures to exist under the water. Now, a fish has a special part of its body made for the purpose of getting the air out of the water. The water is taken in by the fish, and allowed to flow along very close to thin blood-vessels in what are called the gills.

As the water flows past these blood-vessels, it gives up to them part of its oxygen, and takes from them their carbonic acid. But we have no gills, though there is absolute proof in our bodies, when they are very small, that we are descended from creatures which did have gills. Gills are only adapted for breathing in water, and the fish dies of suffocation in the air. Our lungs are only adapted for breathing air, and we die of suffocation in the water. Besides, our needs of air are much greater than those of a fish, and even if our lungs were capable of getting the air out of water that might be inhaled into them, there would not be enough to keep us alive.

WHAT DOES A "BIRTHRIGHT" MEAN?

In nearly every part of the world, at one time or another, alike among savages and among civilised people, the eldest child, or, rather, the eldest son, has special rights and privileges over the others. He often inherits most or all of his father's property, and has a special right to his father's title and position, whether as chief of a savage tribe or as a duke or king or whatever it may be in a civilised country.

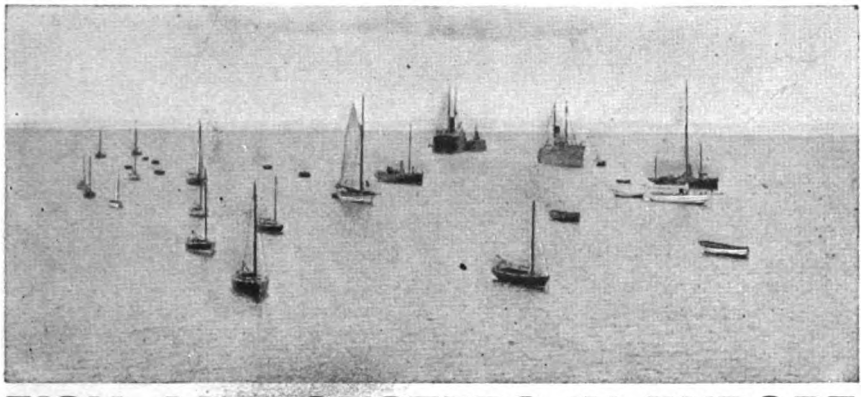
This right of the first-born is called his birthright, and the Bible story of Esau and Jacob is sufficient to tell us how old this custom is. It has a special long name which we shall certainly meet sometimes, and which we must therefore learn. This name is primogeniture, and really means first being born. In some parts of the world this law of birthright or primogeniture has been abolished, and sons inherit equally, and have equal rights. France led the way in this respect, probably as a protest against the ancient custom of titles being transferred from father to eldest son

The next Questions are on page 3859.

THE BOATS THAT CATCH THE FISH

Fishing has become one of the important British industries, about 100,000 men being engaged in catching the fish at sea, while thousands more are occupied in preparing and selling them on land. The value of the fish landed in the United Kingdom in one year is about $50,000,000, while the weight of a year's catch is equal to 10,000,000 sheep and 1,000,000 cattle. In this picture we see fish being landed at Newlyn, in Cornwall.

Here we see fishing-boats at rest in the harbour at Mousehole, a little village near Newlyn. The fish caught in the Cornish fisheries are chiefly mackerel and pilchards, and their value in a year is about $350,000 The fisherman's calling is toilsome and dangerous, and in ten years 2,500 men engaged in the British fisheries lost their lives, in one way or another. Four-fifths of the fish landed in England comes from the North Sea.



FISH AND OYSTERS IN EUROPE

CONTINUED FROM 3658

A GREAT army of about 100,000 fishermen are engaged in the fisheries of Great Britain, and, besides these, there are thousands and thousands engaged on shore making barrels and boxes for the fish, and salting, curing, and packing the fish. There are all sorts and sizes of boats at work, from the big steam-trawlers to the little sailing boats—26,000 of them, all told. The fisheries of Russia are next in importance. Herring, salmon, and sturgeon are the chief catch. The French catch cod, herring, mackerel, and many small fish are packed and called sardines. Oysters are extensively cultivated. The people of every European country which has a sea-coast must depend upon fishing for a large part of their food supply.

Most of the fishes are caught in nets. The most important method is trawling. A great net like a huge bag is dragged over the floor of the sea. The lower part of the net stirs up the fish at the bottom, and makes them rise, when they are caught by the upper part of the net and forced into the interior, ready to be tipped out into the vessel when the net is hauled up. Many of the trawl-nets are carried by sailing vessels, but more and more steam-trawlers are employed, so that now every day of the year 1,500 square miles of ocean-bed are swept by the nets of British trawlers. Steamers go out and take the catch of many of the sailing fleets, but many of the big trawlers can store their fish in ice until they return to port.

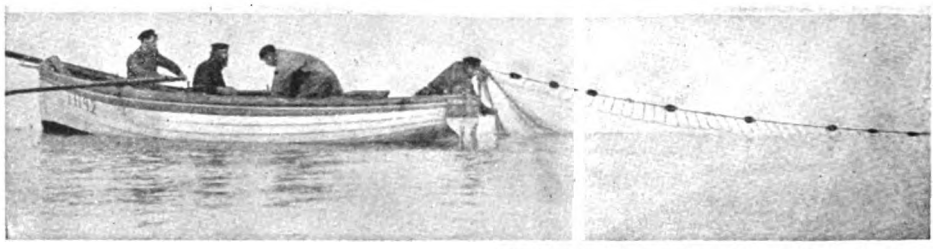
The trawl-net is serviceable only for smooth sea-floors. Where the bed is rocky, lines, miles in length, and carrying nearly 5,000 hooks, are used.

Next we have drift-net fishing. At the seaside we sometimes notice a long line of black corks floating on the top of the sea. If we could look down into the water, we should see that the nets hang straight down from ropes attached to these corks, like a wall of netting. The herrings get their heads caught in the meshes of the nets. They cannot go further through because their bodies are too big, and they cannot get back because their gills are entangled.

Seine net-fishing is another form, but this kind of net is worked from the shore. A boat goes out to sea carrying out one end of a net, of which the other end is held fast on the beach. A semicircle of the sea is enclosed by the net, whose second end is then made fast on the beach. Then the whole net is drawn to shore, with the fishes in it.

A great deal of money is invested in the fishing fleets, and many thousand men risk their money and their lives in this dangerous occupation.

CATCHING SPRATS OFF THE EAST COAST



In this picture we see a drift-net for sprats being let out from a boat. The net has pieces of cork placed at intervals along the top in order to keep it floating, and one end of the net is fastened by a rope to the boat. The boat then drifts, and the fish, swimming against the net, get their heads caught in the meshes and cannot escape.

The net is then hauled in and the boatmen row ashore. Drift-nets are used only for fish that swim near the surface of the sea, like mackerel, pilchards, and sprats, and usually a number of the nets are fastened together.

The boat on reaching shore is pulled up on the beach, and the sprats are then shaken out of the nets, ready to be sorted and packed for the market. The pictures on this page show sprat-fishers at Aldeburgh, in England.

PACKING THE SPRATS FOR THE MARKET

Having shaken the sprats clear of the nets, the fishermen then measure their catch in large metal cans, as shown in this picture. The fish are now ready to be packed and sent to the markets for which they are intended.

Here we see the sprats being packed at Aldeburgh into boxes, ready for despatch to London. They are carried from the boat to the boxes in the metal pails used for measuring the catch, and when full the boxes are fastened up. The quantities of fish caught vary very much, of course, but as many as fifteen tons have been caught in a single day by the nets of one boat. Young sprats are often packed in oil and sold as sardines.

A GREAT HARVEST OF HERRINGS

Here we see a catch of herrings being landed on the East Anglian coast. These fish are caught by drift-nets, and they form the principal fishery of the United Kingdom, the value of the herrings landed in a year being equal to about $10,000,000. It is estimated that 2,200,000,000 herrings are landed in Britain in one season.

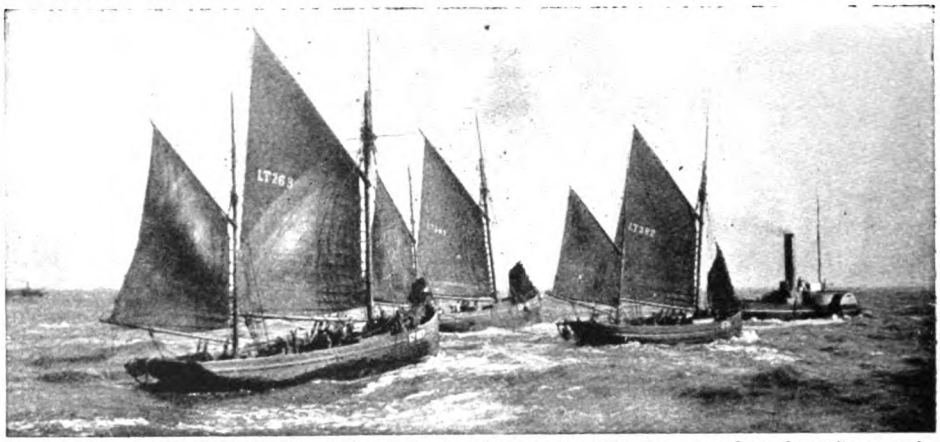
This great mass of herrings on the quay, waiting to be packed, will give some idea of how many fish are landed at once. Some time ago a single lugger brought to land a quarter of a million herrings, which realised $900, the result of a single night's fishing. Herrings are caught principally in the North Sea, where they always abound.

MILLIONS OF HERRINGS FOR THE SHOPS

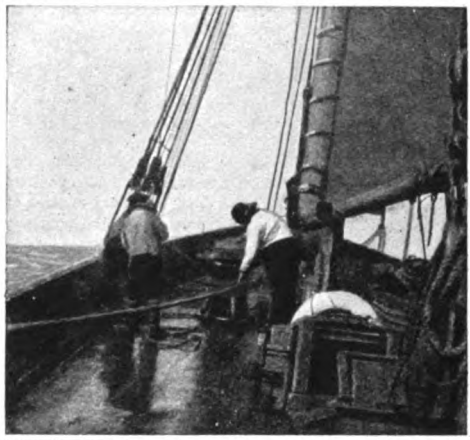
After being landed on the quay, as shown in the picture on page 3768, the herrings are sorted up into various sizes and placed in large tubs, ready to be sent off to London and other large towns. The principal centres of the North Sea fishery are Hull and Grimsby, which have more than $20,000,000 invested in steam-trawlers alone.

Here the herrings are ready for despatch, and, as can be seen, there has been an excellent catch. The finest kinds of fish, such as soles, turbot, and brill, as well as haddocks, whiting, and cod, are caught by trawling—that is, by dragging a great net along the bottom of the sea. This can be done because nowhere is the North Sea so deep but the cross of St. Paul's would show above the water if the cathedral stood on the bed of the sea.

TRAWLING-SMACKS AND STEAM-TRAWLERS

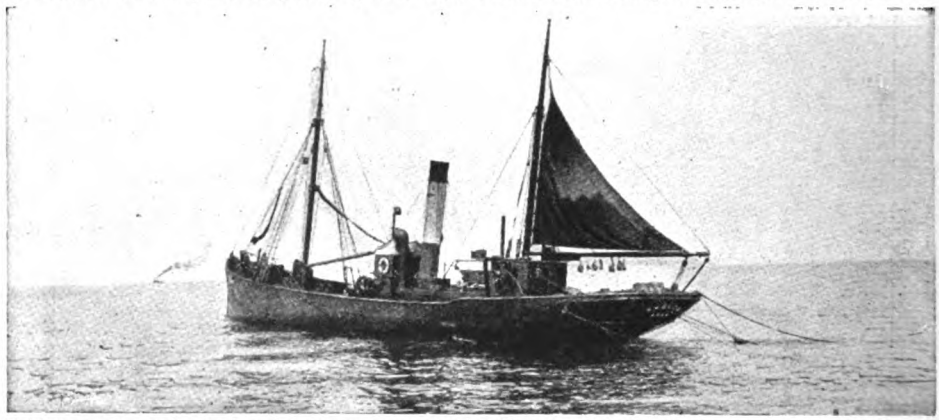


Of all the British methods of fishing, trawling is the most important, and here we see a fleet of trawling-smacks in the North Sea. It is only during the last sixty years that trawling has come into general use. The word trawl means "to go hither and thither," and in trawling a net is dragged by the boats along the sea-bottom.



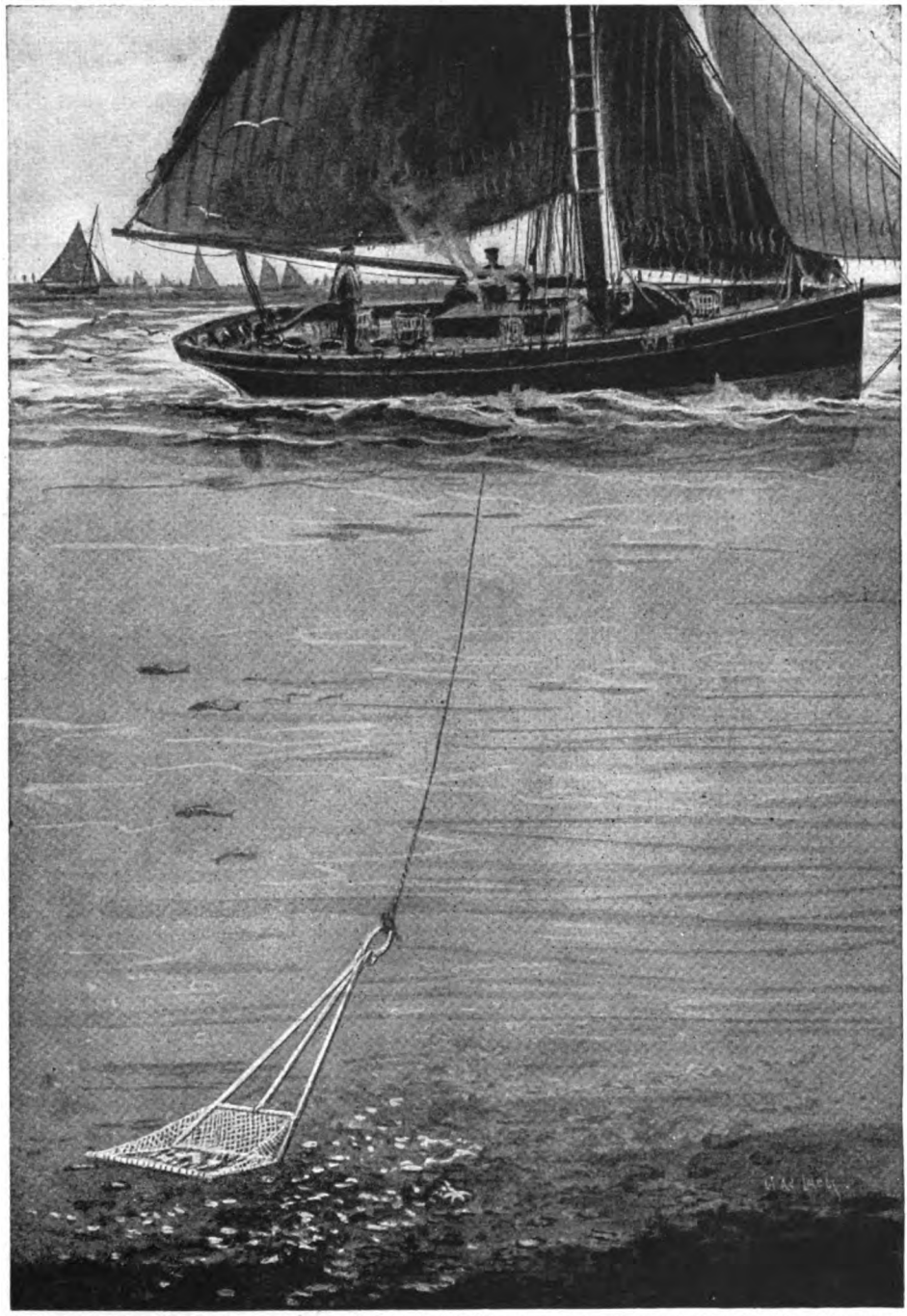
The finest fish, such as soles, turbot, and brill, are caught by trawling. As the net is dragged along the sea-bed the fish are caught in the mouth of the trawl, which is then hauled on deck, as is being done by these men.

The trawlers remain at sea sometimes for weeks, and their catches are collected by steamers that take the fish to London. Ferrying the fish from trawler to steamer is often dangerous work, as can be seen here.



Sailing smacks are fast giving place to fine steam-trawlers like that shown in this picture. These vessels cost about $35,000, but can do the work of nine or ten sailing boats. One steamer, after towing her trawl-net for only four hours, caught over seven tons of fish. Steam-trawlers began to be used only about thirty years ago.

GATHERING OYSTERS FROM THE SEA-BED



A few years ago 500,000,000 oysters were bought in London every year at a cost of $500,000 but the supply has since decreased and the price greatly increased. The most notable oyster-beds in England are at Whitstable, in Kent, and here we see the method of collecting the oysters known as dredging. These shell-fish are **sometimes collected from the beds by rakes and tongs, but dredging is the usual method, although it is a very destructive process, and is sometimes said to kill more oysters than it secures. The frost in the winter of 1890 did $75,000 worth of damage to the oysters of two companies that have oyster-beds at Whitstable.**

The photographs on these pages are by Jenkins, Lowestoft; Gibson & Sons, Penzance; Temple; and the International Press Agency.

GATHERING MUSSELS AT LOW TIDE

While mussels are wastefully used as manure on the English coast, they import large supplies of this shell-fish from Holland and Belgium for human food. It is a rather popular food in England, though it is not eaten in America, and is very little used for food in Scotland. Here we see a large mussel-bed on the Belgian coast as it appears exposed at low water. In this country and in most European lands mussels are largely used as bait.

A Belgian woman gathering mussels from a natural bed of this shell-fish, found on a breakwater.

Mussels growing on a piece of wreckage that has been cast ashore and embedded in the sand.

A mussel-fisher of the Belgian coast gathering the fish at low water from the piles supporting a pier.

The people of Holland cultivate artificial beds of mussels, and here we see a Dutch mussel-farmer in his boat raking up the fish for market. The Dutch are very successful at this artificial mussel-rearing, but it is interesting to know that they get a very large proportion of their spawn, or eggs, from the coasts of Kent and Essex.

AT WORK ON A GREAT OYSTER FARM

At many parts of the coast of France, oysters are reared artificially, and here we see, at low water, a corner of the great oyster nursery at Cancale, which lies on the north of Brittany, opposite the island of Jersey.

Another famous French oyster fishery is that of Arcachon, on the Bay of Biscay, near Bordeaux. It is visited every year by thousands of English people, to whom the picturesque oyster-women working in trousers, like men, are a familiar sight. They are here seen gathering the oysters from the beds for the market.

In this picture we see the rearing-cases used at Cancale. The spawn, which is known as spat, and really consists of eggs, is placed in these cases to hatch, and the oysters are kept here till they are six months old.

COLLECTING AND WASHING THE OYSTERS

Hundreds of women are employed in the oyster industry at Cancale, and here we see an oyster-gatherer at work.

After they have been gathered, and before being packed for market, the oysters are washed in special baskets.

On page 3773 we see the rearing-cases where the spat, or spawn, is hatched. When the oysters are six months old they are removed, as is being done by the men in this picture, and placed in the oyster-beds.

Here the oysters are receiving a final washing before being packed. They are plunged up and down in the **water and vigorously shaken in the cleansing-baskets.**

At last, when the cleansing is complete, the oysters are put in square baskets, like the one seen in this **picture, and wheeled on trucks to the packing sheds.**

THE NEXT FAMILIAR THINGS ARE ON PAGE 3885

WHAT THIS STORY TELLS US

IF we make a careful examination of the brain, and especially of the new brain, we find that it is truly a double organ. It is easy to prove, in other ways, that the two sides of the brain differ very much in their duties and their importance; but actual examination of the brain itself does not show us the differences that we might expect. Though the brain has everything to do with the question of right-handedness and left-handedness, no one could tell whether a man was right-handed or left-handed by examining his brain. It is important to set this out clearly at first, lest we should think that one side of the brain is in some way inferior to the other. This is not so. One proof of this is to be found in the fact that either side of the brain can be educated for special purposes; and if one side fails, the other will do just as well, provided that we call upon it during our early years, when almost all things are possible.

THE PARTS OF THE BRAIN

CONTINUED FROM 3721

THE great majority of people are right-handed; only a few are left-handed. No one is perfectly equal-handed in everything he does. Many people have to be both-handed in certain respects. The violinist, for instance, has to train one hand for one kind of work, and the other for another, both equally difficult, though different. The pianist has to train both hands to do exactly the same work. Now, people who know nothing of this subject think sometimes that there is some natural difference between the two hands, or the two arms, or, as in the case of a footballer or an organist, between the two feet. That is a mistaken idea; the whole question is a question of brain, and we have already seen that there are no natural differences between the two sides of the brain, so far as we have been able to discover.

The first thing for us to do is to trace the connection between the brain and, say, the arm, and at once we find a very remarkable thing, which no one would have expected. If we begin at the great centre—in, for example, the left side of the brain—which controls all our intentional movements, we find that a large number of fibres from the nerve-cells in it are gathered together to form a bundle, which is, of course, the great path of the will. This bundle runs down through the brain—on the left side, of course—but gradually approaches the middle line of the body, and then, at a certain point, practically the whole of it crosses over to the right side. This happens in the part of the brain called the bulb. The consequence of it is that the left side of the brain is the master of the right side of the body. Exactly the same is true in respect of the right side of the brain and the left side of the body.

When we call a person right-handed, then, we really mean that he is left-brained, and that a left-handed person is right-brained. In either case we must describe the brain as having a leading or more important half, and in a short time we shall come to see that when a person is left-brained, this affects not only the use of the right hand, but many other functions of the body.

Now, we have already learnt that the two sides of the brain at birth are exactly the same, so far as anyone can make out, and even in later years no one can find any difference between them. Why, then, do people become left-handed or right-handed? Why are there so few left-handed to so many right-handed people? And, if the two sides of the brain are naturally the same, why are we not all both-handed? It is best to begin answering these questions by settling the last point first. The reason why

we are not both-handed is a matter of economy. Life does not like waste. If one thing will do her purpose, Nature does not employ two. When the education of the brain starts, if one side of the brain has the advantage, Nature favours that side. Nature is like a schoolmaster with two boys in his class, one of whom gets a slight start, while the schoolmaster neglects the other altogether.

WHY ONLY ONE SIDE OF THE BRAIN NEEDS TO BE EDUCATED

There is no need for both sides of the brain to be equally educated. One side gets an early advantage, and then the more it has, the more is given to it. But it must never be forgotten—though it usually is forgotten—that the less-educated side of the brain is naturally just as good, and has quite equal possibilities of being the leading half; so that there is always this other half of the brain to fall back upon. We must see how this works out.

A man of seventy may meet with some kind of accident or injury, visible or invisible, which prevents the working of the leading half of his brain—the left half, if he is a right-handed man. There is still the right half of his brain available for the same kind of work. With labour and patience, he may be able to teach the right half of his brain to do very imperfectly one or two things which the left half of his brain used to do. But I fear that in cases like this the poor man is almost as badly off as if he had nothing to fall back upon. The reason for this is that when people get old the brain's power of learning becomes less. During youth is the best time to learn. Now let us take the case of a little child of five or thereabouts: he can talk, and perhaps even read a little; he can draw, and even make a few simple letters with his right hand.

HOW THE BRAIN REPAIRS AN ACCIDENT TO ITSELF

Some accident may affect the working of the child's brain, just as in the case of the old man; but the difference between the two cases is tremendous. The right half of the little boy's brain now simply takes the lead. It is true that, as we shall learn, he has to begin again by saying "Papa" and "Mamma," just like a tiny baby; but yet, because his brain is young and still developing, a child like this will, in a year or two, be practically as well off as if the accident had never happened at all. Such cases are not very common, but they are quite well known.

But we have still set ourselves some questions which must be dealt with. We have already decided why people do not become both-handed, unless, like the pianist, they have some special reasons for setting both sides of the brain to learn the same lesson. But we still have to find out why there are about ten or more right-handed people to one who is left-handed, and the puzzle is greater because, as we have seen, there is nothing to be found in the brain itself to explain this difference.

Well, in the first place, it is certain that custom, tradition, and prejudice have something to do with the difference between the numbers of right-handed and left-handed persons. It is probable that a very considerable number of children, at any rate, are born with no natural bias in favour of either hand.

RIGHT-HANDED PEOPLE AND LEFT-HANDED PEOPLE

It is interesting to make observations on babies in this respect. Often it is impossible to make out that they prefer the use of one hand to that of another, but when we begin to teach them things, we usually favour the right hand; in other words, it is the left half of the brain that gets all the practice and education, and so it gets the lead. We notice this in games as in everything else.

In England it has been noticed that many cricket-players from poor families throw, bowl, and catch with the left hand, but they bat right-handed. Many of these were, I believe, naturally left-handed. They preferred to throw with the left hand long before they started cricket; but when they began to be taught to use a bat, they were told to stand in a right-handed position. In cricketers drawn from wealthier families, it is very seldom that left-handed players are found, and especially left-handed batsmen. The reason is that as boys they were specially looked after from the first, and even those who would naturally have become left-handed have been made right-handed. When we notice things like this, we can understand that a great many of the estimates which

are made as to right-handedness and left-handedness are mere nonsense, because those who make the estimates forget the whole question of education. Some well-known authorities, for instance, have said that there is some relation between crime and left-handedness. The real truth is, however, that there is a connection between crime and lack of education, and there is more left-handedness among uneducated people, because there are fewer parents and teachers to be particular as to which hand the child uses. There is absolutely no connection whatever between right-handedness or left-handedness and any of the higher qualities of mind and character.

But, even when we allow for education, it seems quite certain that there is a commoner natural bias towards right-handedness than towards left-handedness, and this requires explaining. One kind of explanation is that the tendency is inherited, and this is interesting as far as it goes, but, of course, it does not tell us how the tendency began.

WHY SOME BABIES ARE BORN RIGHT-HANDED AND OTHERS LEFT-HANDED

It seems quite certain that, even apart from imitation and education, right-handed parents tend to have right-handed children, and left-handed parents to have left-handed children. Of course, in making studies like this, it is all-important, and also very difficult, to be sure that we allow for the consequences of education and imitation. But, with care and trouble, it is possible to do so, and then it becomes clear that heredity works in this way.

We already know that the question of the supply of blood is, perhaps, the most important of all questions for any living tissue; we know that it is, above all, important for nerve-cells. It requires only two or three seconds' interruption of the flow of blood for nerve-cells to stop working, as we see when a person faints. Thus it would be very interesting if we could find any difference in the blood-supply of the two sides of the brain; and some people have supposed that perhaps the left side, as a rule, gets a rather more rapid and fuller supply of blood than the right. If we examine the blood-vessels of the chest, from which run the arteries to the head, we find a certain amount of evidence in favour of this view. The arteries are so arranged that the blood-supply to the left side of the head seems to be rather more direct than to the right side. But when we examine the brain itself, it is impossible to find that either side is better favoured with blood than the other, and it is not thought that this question, about which a great deal has been written and argued, is of very much importance.

SOMETHING ABOUT THE BRAIN THAT NO MAN UNDERSTANDS

The truth is that, after all these years of study, and though a whole library of books has been written on the subject, we still do not really know why more people should be left-brained than right-brained, except in so far as we know that the bias of education is partly responsible.

This question would be far less important if the difference between the leading half and the led half of the brain were only a matter of the comparative skill between the two hands, and that, of course, is what most people think. But, really, that is far and away the least part of the whole matter. Within the last twenty or thirty years we have learnt that the right-handed—that is to say, the left-brained—person is not only more skilful with the left side of his brain in the use of his hands, but he speaks and writes with the left side of his brain; he reads with it; he follows music with it; and left-handed people do all these things with the right side of their brains.

Let us begin with the case of hearing. Everything goes to prove that, so far as the mere hearing of sounds is concerned, the two sides of the brain are quite equal in every healthy person; but there are certain kinds of sounds which we call language, and they introduce another need. It is not sufficient to hear; we must also understand, for we may hear someone speaking in a language without understanding it.

THE SPECIAL PART OF THE BRAIN THAT UNDERSTANDS WORDS

It has been proved that in right-handed people the understanding of words is entirely done by the left side of the brain. A special part of the brain there has been taught to perform the duty of understanding words. It is called the word-hearing centre. If it is thrown

out of action by anything, the person will hear perfectly, but only as a child hears, or as we hear an unknown language. There is good evidence to show that, where people know more languages than one, the understanding of them is not all mixed up in one particular part of the brain, but that they have their own little centres, developed by education, situated near or on the outskirts of the ordinary hearing centre in the leading half of the brain, whether that happens to be the right or the left.

WHY WE SOMETIMES HEAR WORDS WITHOUT UNDERSTANDING THEM

We have all noticed that sometimes, when we are not attending to the talk of those around us, we hear that something has been said, but do not understand it, and so perhaps we say: "I beg your pardon"; and before our friend has time to repeat what he said, we have understood it. The words were recorded and heard in the hearing part of the brain, but the reason why we did not "take in" what was said was that the sounds had not been *taken* from that part to the word-hearing centre, where alone they could be interpreted. A second later, when we attended, that happened. A case like this helps us to understand not only the working of the brain, but also what is meant by attention.

In the case of music, too, it is one thing merely to hear, and another to understand. In this case, also, it seems that there is a special centre developed in connection with, and close to, the hearing centre in the leading half of the brain. The brains of some well-known composers have been examined after their death, and it seems clear that some of them have a specially rich development of the cells in this part of the brain.

THE MANY LESSONS WE COULD LEARN BY EXAMINING A GREAT MAN'S BRAIN

It is worth while to note, in passing that a valuable service is rendered to future generations when a great man, whose brain has already been invaluable to humanity, gives orders that, when he dies, his brain may be examined, so as to add to our knowledge of this most wonderful of all wonderful things. In point of fact, we are only just at the earliest beginnings of our knowledge of the brain and its working. We know a little of the brain in general, but we have practically everything yet to learn as to the all-important and endless differences between one brain and another. At present the study has almost entirely to be made upon brains of persons who were not at all noteworthy, but our biggest need is to study the brains of great and unusual people.

It is known that not a few of the wisest of living men have given orders that, after their death, their brains are to be examined for the advancement of knowledge. We have yet to learn all about the brains of people of great general ability—people who are very clever with figures, artistic people, musical people, clever writers, great thinkers, and so on. There is an extremely interesting theory about the finest kinds of brain, which we shall learn in a little while.

Now let us turn to the case of seeing. We are certain that things are seen perfectly on both sides of the brain, but we know that in right-handed people, for instance, it is only in the left half of the brain that reading is accomplished. If the word-seeing centre is thrown out of order, the person will see as well as ever he did in his life; he could make perfect copies on a piece of paper of the letters he has in front of him; but they mean no more to him than to a baby.

A SENSE THAT IS GREATER IN MAN THAN IN ANY OTHER CREATURE

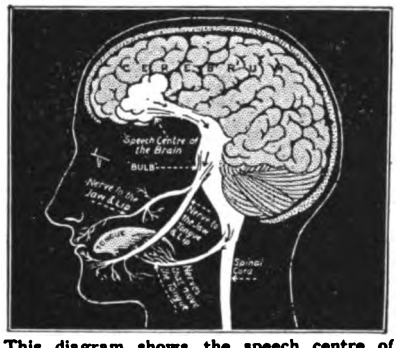
It is also probable—though we do not yet know this for certain—that, just as is true in the case of music, the higher kinds of seeing are done in the leading half of the brain. It may be that the kind of seeing done by the artist is done by the leading half of the brain. According to some students, it may even be that we also appreciate colour in the leading half of the brain.

This is a subject about which we have yet a great deal to learn. It is possible, however, to find out, in a given brain, very precisely what are the exact limits of the seeing area, which, as we know, is at the very back part of the new brain. Now, we find that this seeing area has been growing, so to speak, for ages past in the main line of progress of animal life, and that it is much larger in man than in any other creature; it also varies very largely in different human beings. In the brains of many idiots, and also in the brains of some of the lowest savages, we find very notably that the vision area is small compared

with what we find in the brains of healthy individuals of the higher and more intellectual races of mankind.

Now, the hearing and seeing of words come first in order, so to speak, because we must receive before we can give; and after that we ought to study the way in which we speak and write. Of all these various centres, it is, of course, the word-hearing centre that first develops in a child, and after that the speaking centre. These really form a pair. In persons who have been taught to read and write, another pair is developed—the reading or word-seeing centre and the writing centre. Let us now study the speech centre.

We have only to think for a moment to realise that in some ways the speech centre must be the most wonderful and important part of the human brain. Of course, reading and writing are enormously important, but then they are really only a newer kind of speech, after all. Now, it is speech, or language, that is one of *the* great marks of mankind. In many ways we are human just because we can speak, and so we may say that the speech centre in our brains marks the beginning of what really has made, and makes, us human, and far more wonderful than any other living creature that is known.



This diagram shows the speech centre of the brain, known as Broca's area because it was discovered by a Frenchman named Broca. The same part of the brain controls the muscles of the lips, tongue, and jaws. The arrows show the direction in which the nerves convey the impulse to the muscles.

Of all the special centres in the human brain, this was the first to be discovered, which is very appropriate, as it must have been the first to be developed. It was discovered by a celebrated Frenchman named Broca, about the middle of the nineteenth century, and is known as Broca's area. In the picture on this page, showing the left side of the brain of a right-handed person, we see the speech centre. If we examine the brain from rather another point of view, and note, in the area for motion, the various points that control the different muscles of the body, then we find that the speech centre lies in the same part of the brain as that which controls the muscles of the lips, tongue, and jaws. But it would be a great error to suppose that that is all the speech centre does. The muscles which we use in speaking are all represented on both sides of the brain; but it is one thing to be able to move them, and another to be able to speak with them. If anything happens to throw the true speech centre out of action, the person can still use all his muscles.

If we say a word, he can say it after us; but he can no more speak, in the real sense of speaking, than an animal can. He may imitate like a parrot, but that is all. The only exception to this is that, in many cases, just a few words, like yes and no, are still kept, and the reason seems to be that they have been so often used that they have found a home in the other side of the brain also. It has been discovered, also, that rough persons who use bad language are still able to use an oath or two when all the rest of their power of speech is gone. They have used these words so very many times that they seem to have become firmly fixed in both sides of the brain. Though the speech centre has been known for many years now, and though the study of illness and accident has taught us a good deal about it from the point of view of disease, we still have almost everything to learn about it from the point of view of health. Everyone knows that different races and different individuals vary very much in their power of speech. Everyone knows, too, that some of the wisest and most thoughtful of men speak slowly and with hesitation, and with many mistakes, even in private conversation, while they can speak in public scarcely at all. On the other hand, men who are neither wise nor thoughtful often hold a large audience spellbound for an hour. But sometimes a wise man may also be a good speaker. These facts express a truth which applies generally to the whole of the brain and its uses. It is that different parts of the brain vary independently of each other. One man may have a splendid speech area, and

the rest of his brain may be commonplace; or it may be the other way round. We have all heard what was said of the poet, Oliver Goldsmith: "Who wrote like an angel, and talked like poor Poll."

One of the few really great poets of the last half century, who wrote many poems which will be read as long as English is read, was a most stupid and hesitating and commonplace talker. This proves that the speech area of the brain, like other areas of the brain, is an extremely independent thing.

THE POWER TO TALK, WHICH CAN MAKE FOR GOOD OR FOR EVIL

This has a very great importance for any nation that is governed as we are governed. Many people think that all that is necessary to prove a man a good law-maker is the power to speak well on any subject. Now, everyone who votes for members of our Congress ought to know that the mere power to talk, though it is a very notable thing, and may be a very useful thing, and has often altered the history of nations for good, has yet often altered their history for evil, and so helped to destroy them.

The wise, strong, priceless man may be silent; it is even possible that he may be so busy thinking that he has not time to speak! Wise people who look around them know all these facts; but the interesting thing is that our modern knowledge of the brain, and especially what we are learning as to the independence of the different parts of the brain, and the way in which they vary in different people, independently of each other, all teach us the same lesson. It will be a very good thing when all of us who have a share in deciding who shall govern us use our educated judgment in this very important matter.

THE DIFFERENCE BETWEEN FINE BRAINS AND COMMON ONES

And now we may consider a theory which probably helps us to explain in some degree the difference between fine brains and common ones. There would certainly be a great difference between a pianist who always practised with one hand only, and always with the same hand, and another pianist who practised with both hands. If those two sat down one after the other to play a great piece of music, everyone would know the difference. Again, it can be proved that it makes a great difference to people whether they use only one eye in looking about them, or whether they use two. In the case of those people who do not see straight, or in people whose eyes are very unequal, which is more common, we find that the constant use of one eye only greatly deprives them of the power of judging distances, of seeing perspective, and of realising the depth and solidity of things.

Anyone who has ever looked through a stereoscope knows what a tremendous difference it makes to look at an ordinary photograph, and then to look at a stereoscopic view, using both eyes. When we use both eyes, that is a case of what is called binocular vision. A very wise man, called Dr. John Brown, who wrote "Rab and His Friends," suggested many years ago that some people seem to differ from others as if their thinking were, so to speak, binocular, and so they saw the perspective and depth of things. This is a rather good idea. Herbert Spencer, also, had the same idea as Dr. Brown; but, as he was a great student of the mind and the brain, he was able to develop the idea.

GREAT THINKERS, WHO USE BOTH SIDES OF THE BRAIN

He suggested that in good thinkers the two sides of the brain were probably used together much more than in ordinary people. When we look at the huge bundle of fibres that run across from one side of the brain to the other, we can see the force of this. Some day it may be proved that Herbert Spencer's theory is true, not only of thinking, but also of understanding and creating poetry and music, beautiful pictures, and so forth. One of the deeply interesting questions yet to be decided, probably by the present generation, is how far and in what ways, by our education of the young, we can develop to the utmost both sides of the brain, without waste of power and without lowering the quality of the education of both sides. This last is a most important point. There is nothing gained if we educate both sides of the brain to a lower standard than we could reach if we worked on one side. We must be content to let one half of the brain lead and the other be led.

The next part of this is on page 3867.

READING

WHY AN ADJECTIVE IS LIKE AN ADVERB

CONTINUED FROM 3714

WHEN we ended our last lesson the boy was still up the tree, and the angry farmer was standing at the bottom waiting for the boy to come down. What happened next? We can find out by asking these three questions and reading the answers:

1. When did the farmer go away? SOON.

2. How did the boy get down? EASILY.

3. Where did the boy go? HOMEWARDS.

Now, the three words printed in big letters are Adverbs. The first one, SOON, tells us something about the time at which the farmer went away, so it is called an Adverb of Time. The second one, EASILY, tells us the manner in which the boy got down, so it is called an Adverb of Manner. And the third one, HOMEWARDS, tells us the place towards which the boy went, so it is called an Adverb of Place. We shall find that nearly all adverbs belong to one or other of these three classes: TIME, PLACE, MANNER. Let us make up three lists of words and put some adverbs in them.

TIME	PLACE	MANNER
Now	Here	Badly
Then	There	Cruelly
Soon	Everywhere	Kindly
By-and-by	Hither	Dearly
Presently	Thither	Ill
Again	Above	Well
Formerly	Below	Bravely

You can practise some more for yourselves. Think of other adverbs, and see in which of those three lists they will go.

Now let me ask you a riddle. Why is an adverb like an adjective? Because they can both be compared. You remember learning about the comparison of adjectives on page 1174—Tall, Taller, Tallest. Now, there is comparison of adverbs as well as of adjectives, only adverbs are nearly always compared by putting MORE and MOST in front of them, as:

POSITIVE	COMPARATIVE	SUPERLATIVE
Easily	More easily	Most easily
Cruelly	More cruelly	Most cruelly
Gladly	More gladly	Most gladly

But just a few are compared like adjectives, as, Soon, Sooner, Soonest. We cannot say, Easily, Easilier, Easiliest—that would be wrong.

There is one more thing about adverbs before we leave them. We have learned that they are generally used with a verb; but sometimes they are used with an adjective or even with another adverb. If I say "You are very clever," the word VERY is an adverb telling us something about the adjective CLEVER, and in the sentence "This is truly beautiful," TRULY is an adverb, joined to the adjective BEAUTIFUL. And in the three sentences that follow you will find one adverb used with another adverb, the first telling us something about the second.

Puss walks VERY FUNNILY.
Jack ran EXTREMELY FAST.
Brer Fox steals QUITE EASILY.

So we can say that an adverb is a word that is used with a verb, or an adjective, or another adverb, and tells us something about the word with which it is used. If we remember that, we shall soon be able to recognise all the adverbs that we meet, and say "How do you do?" to them.

Now we come to some words that are very like adverbs; in fact, some of them try to pretend they are adverbs. They look so exactly like them that we have to look at them very hard indeed before we can find out whether they are or not. You remember we put the words "above" and "below" in the list of adverbs of place, and they *are* adverbs in such sentences as "The sun shines above," "The caves are below." But if we write "The sun shines above our heads," or "The caves are below the surface of the earth," the two words ABOVE and BELOW have changed from adverbs into PRE-POS-I-TIONS.

That was very clever of them—was it not?—and perhaps they thought we should not notice the change, but go on thinking they were adverbs still. But we were too sharp for them, and we caught them at it. How do we know that they are now prepositions? Because each of them has a noun after it.

This is quite simple, and you will see the difference at once. In the sentence "The sun shines above," the word ABOVE tells us where the sun shines, and so it is an adverb of place. But in "The sun shines above our heads," ABOVE goes with the words "our heads," and governs them. Because prepositions are usually placed in front of the nouns they govern, they are called prepositions, which means *placed before*.

Of course, you may say, "But the three words ABOVE OUR HEADS tell us where the sun shines, and therefore they are an adverb." And you would be quite right, for, taken together, the three words are equal to an adverb, and are called an "adverbial phrase." But if we take them separately, we must call ABOVE a preposition, OUR a possessive adjective, and HEADS a noun.

All those little words, like ON, TO, OF, AT, THROUGH, BEFORE, AFTER, WITH, UP, DOWN, BY, FROM, when followed by a noun, are prepositions. Here are a few sentences showing some of these words used both as adverbs and as prepositions:

The boy stood ON the burning deck (preposition).

If you look ON further, you will find some more sentences (adverb).

Though I walk THROUGH the valley of the shadow of death (preposition).

The arrow went right THROUGH (adverb).

They all ran AFTER the farmer's wife (preposition).

And Jill came tumbling AFTER (adverb).

Now try these for yourselves, and find out which are adverbs and which are prepositions:

UNDER a spreading chestnut tree
The village smithy stands.

AFTER breakfast, run a mile.

He looked ABOVE, he looked BELOW,
But no one could he see.

Look IN, and you will see the baby IN his bath.

Up ABOVE the world so high,
Like a diamond IN the sky.

BESIDE the lake, BENEATH the trees,
Fluttering and dancing IN the breeze.

We have now learned something about all the different parts of speech, except the Conjunctions. These will not take us long, for there are not very many of them. But they are very useful words, so we must not leave them out. When we want to talk about two things—(1) pen (2) ink—how do we do it? We do not say "Pen, ink," but "Pen AND ink." We have joined the two words together by the word AND, and so AND is called a Conjunction, which means "a joiner together."

You know what a railway junction is. It is a place where several lines join. So you can easily remember "Conjunction," a word that joins other words together. The two most commonly used are AND and BUT, and you must use these hundreds of times every day: "Bread and butter," "Boys and girls," "Not jam, but marmalade."

Conjunctions can also join sentences together, as well as words.

Jack fell down AND broke his crown,
AND Jill came tumbling after.

I heard a voice, BUT could see no one.

We will try these sentences, ALTHOUGH they are hard.

That is enough about Conjunctions, and that finishes the different kinds of words. We are not going to reckon in the little words that you shout out when you are either very happy or very sad—words like "Oh!" "Dear me!" "Bother!" "Alas!" "Well!" "Gracious!" These are sometimes called Inter-jections, which means *thrown-ins*, because they are just thrown in anyhow into a sentence without being joined on to any of the other words in the sentence.

And now let us make a list of the different part of speech, or kinds of words, that we have learned. We must be quite sure about them before we go on to our next lessons, which will be much more interesting than these.

MOST IMPORTANT OF ALL
Noun Verb

NEXT IN IMPORTANCE
Adjective—used with noun.
Pronoun—standing instead of noun
Adverb—usually with verb.

NOT SO IMPORTANT
Preposition Conjunction

NOT AT ALL IMPORTANT
Interjection

Or we can say that they are like a family of people. The Noun and the Verb are the grandfather and the grandmother; then come their children (who, of course, are grown up and married, and have children of their own), Adjective, Pronoun, and Adverb; then come the little grandchildren, Preposition and Conjunction; and, last of all, but no relation, the Interjections.

HOW WE MUST NOT WRITE

AFTER the letters to Cousin Jack had been posted, and while the steamer was taking them across the Atlantic, Tom and Nora wrote more letters to their friends.

"As you write more quickly and easily," their mother said, "you will form your letters smaller and keep your pen on the paper until a word is finished. Some people even string their words together, but it is not wise to do that, because it may be confusing.

"It will be well if you remember that a good writer avoids flourishes. Just as we can dress simply, neatly, sensibly, and also prettily, so we can write simply, neatly, sensibly, and prettily, and not make a puzzle of words to bother people and waste their time.

"It is equally stupid to write so small that the reader almost needs a microscope to read what we write.

"Let us think of some of the bad ways of writing. One thing people often forget to do is to cross their t's and dot their i's; or they try to cross the t, but do not really cross it, for the little cross-stroke is running right away from the t, and the dot of the i makes a mistake and wanders off on to the top of another letter altogether. Suppose we treated the i in siege like that, and dotted the e next it instead. Unless the z is made quite unlike the g, the word might be mistaken for seize.

"A very common mistake is to make m, n, and u alike, so that when a word like mummy is written, the m's and u are just an up-and-down sort of wave, and we have to count the strokes to see what the letters can possibly be.

"But it is the capital letters that cause the most trouble. As you know, some are made in more than one way, and that alone makes confusion; and then if people want to make flourishes anywhere they generally want to do so in writing capital letters. The address, date, and name are very important; yet the address and name may be so difficult to read, that I have heard of people wishing to reply to a letter, and having to cut these out of the letter received and stick them on an envelope, in the hope that the clever people at the post-office can make something of them.

"If we make a mistake in writing a word, it is generally better to cross out the word and write again over the spoilt one, for a patched-up word is often impossible to read."

And that is the whole story of how Tom and Nora learned to write.

DIVISION BY THREE FIGURES

OUR next step in division is to attempt examples in which the divisor has three figures, instead of two.

Divide 729205 by 235.

```
235)729205(3103
    ---
    242
    ---
     705
     ===
```

As before, we first draw a line under as many figures as will make a bigger number than 235—that is, we draw a line under 729. It is as well to remember that, *from their position*, these figures stand for seven hundred and twenty-nine *thousands*. The first step of our division will show how many of these thousands can be put into each of the 235 groups—that is, the first figure of our answer will stand for *thousands*.

To obtain the first figure of our answer we have to find how often 235 is contained in 729. To give us an idea of the number we want, we say to ourselves that there are 2 hundreds in 235, and 7 hundreds in 729, and that since 2 is contained in 7 *three* times, therefore 235 *may* be contained 3 times in 729. At any rate, it cannot be contained *more* than 3 times. Next, we go mentally through the process of taking, if possible, 3 times 235 from 729, by saying 3 fives, 15, and **4**, 19; 3 threes, 9, and 1, 10, and **2**, 12; 3 twos, 6, and 1, **7**. This shows us that 3 times 235 is not as big as 729; therefore, 3 is the first figure of our answer.

We therefore repeat the mental process we have just been through, but this time we write down the figures which are printed in heavy type; we thus have a remainder, 24 (thousands).

Our next step is to "bring down" the 2 (hundreds) from the dividend. With the remainder just obtained, this gives us 242 (hundreds). It is evident that 235 can be taken *once* from 242, so that we put 1 (hundred) in the answer, and subtract 235 from 242, giving a remainder, 7 (hundreds).

Bring down the 0 from the dividend, which, of course, simply means that instead of calling our remainder *7 hundreds* we are calling it seventy *tens*. Evidently, 235 cannot be taken from 70, so we write 0 (tens) in our answer.

Bring down 5 from the dividend, thus making our remainder 705 (units).

As in the first step of our work, we divide the 2 hundreds of 235 into the 7 hundreds of 705, and thus see that 3 *may* be the last figure of our answer. By trial we see that 3 times 235 is exactly 705. We have now no remainder, and no more figures in the dividend. Hence, our answer is 3103.

We shall now work a second example, pointing out new difficulties.

Divide 1255629 by 571.

```
571)1255629(2199
    ----
    1136
    ----
     5652
     ----
     5139
     ====
```

After the first step of our work we get a remainder, 113, and on bringing down the 6 we have to divide 571 into 1136. Now, since "5 into 11" goes 2, we know that the second figure of the answer may be 2. Try 2, by saying twice 1, 2, and **4** make 6; twice 7, 14, and **9** make 23; twice 5, 10 and 2, 12. But 12 is bigger than the 11, in our 1136. Hence we know that twice 571 cannot be taken from 1136, and therefore the figure to put in our answer must be less than 2. Clearly, *once* 571 can be taken from 1136, so we put 1 in the answer and proceed as before, with 1 and **5** make 6; 7 and **6** make 13; 5 and 1, 6, and **5** make 11, the figures in heavy type being the figures to be written as we say them.

The only other thing we may point out, though it should scarcely be necessary, is that on dividing 571 into 5652 we say "5 into 56 goes 11." But we cannot have 11 (which at this stage means 11 *tens*) in the answer, because 11 tens make more than a hundred, and we have already put as many hundreds into the answer as possible. The greatest number we can try is 9. Taking away 9 times 571 from 5652 leaves 513. We then proceed as before.

Up till now, we have found there is nothing left over at the end of our division. When we divided 3105 things into 23 groups, we found we could first put 1 hundred into each group, then 3 tens into each group, and finally 5 units into each group, and that we had then used all the 3105 things. Clearly, if we had had 3106 things to begin with, we should still have 1 thing left. We do not attempt to divide this 1 thing amongst the 23 groups; we say that there are 135 things in each group and "1 over."

Now let us divide 72951 by 47.

```
47)72951(1552
   —
  259
  ——
  245
  ——
  101
  ——
    7
```

At the last stage of the work we take away twice 47 from 101, which leaves 7. That is, we have 7 units left over, and we need go no further with the division, because we should only be able to put *part* of a unit into each of the 47 groups. In the same way, any other division sum may have a "remainder," which, of course, is always less than the divisor, otherwise the division must be continued.

What we have called the answer to the division sum is often called the "quotient," because it tells us "how many times" the divisor is contained in the dividend.

ANSWERS TO EXAMPLES ON PAGE 3710.

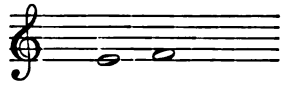
(1) 2192 (3) 19340 (5) 29503
(2) 2134 (4) 1008 (6) 50807

MUSIC

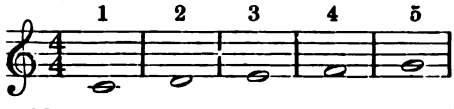
HOW TO PRODUCE THE FAIRY SOUNDS

So far we have found out that "The Fairies' Drill" is written in *common time*, which means we have the value of four crotchets in each bar, and the first crotchet is the most important, so we *press*, or *accent*, *the first semi-quaver*, because it is the beginning of this all-important crotchet. We have also seen that this little exercise contains three major seconds:

and one minor second:

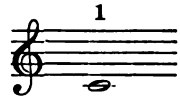


Now we are ready to think how we can play this same exercise, how we can use our fingers, so as to hear the fairies sing their very best. First of all, we must remember that it is *a finger exercise*, so it is our fingers we are going to drill, keeping our hand and arm quite quiet. We must not forget to sit far enough away from the piano to give our arms plenty of freedom, and we must be very careful to have a good horizontal line from elbow to finger, and to keep our hand level. We will write a little preparatory exercise, first to help us to place the keys, and to let us see how to depress them:

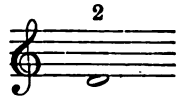


Now we will *rest on the surface* of these five keys, seeing that each finger is over its own particular note, and in the centre of the note; and for this exercise our third finger must be in an absolutely straight line with its note. So far we have only rested on the surface of the keys, and now we want *to produce tone*, so we must move the notes down, but there must be no stiffness, no great exertion, for *very little* force is necessary to keep a note depressed. It simply means that we are gradually to let our arm get looser and looser, till it falls of its own weight, and the notes will then go down without any trouble. If we look inside the piano, we shall see that directly the key is moved down the little hammer jumps up and reaches the string. As soon as the string is set in motion *the sound begins*.

We will now start with the first finger of our right hand on C:

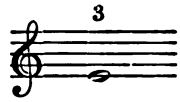


We must be sure not to hit it; the note must be reached gently. While we are counting 1, 2, 3, 4 we must see that the second finger is *raised* and *well bent* over its note D:

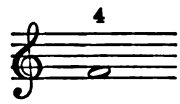


Directly we have come to the end of 1, 2, 3, 4 this second finger must reach the key *on its tip*, just escaping the fingernail, and as soon as D is thus moved below the key-level—that is, as soon as we have moved it down—we release the first finger, and therefore its note C. Again we must count 1, 2, 3, 4, and while we are so doing we

must see that our third finger is raised and well bent over its note E:

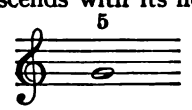


As soon as we have finished counting 1, 2, 3, 4, this third finger must reach the key on its tip, and directly we have thus depressed E we release the second finger, and therefore we no longer hear the note D. Count 1, 2, 3, 4 again, and while thus engaged finger 4 is in readiness over its note F,



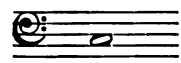
nicely raised, and well bent. Again we finish counting 1, 2, 3, 4, and down comes finger 4, and finger 3 with its note E is released.

We hold F while we count another 1, 2, 3, 4, and at the appointed time finger 5 descends with its note G,

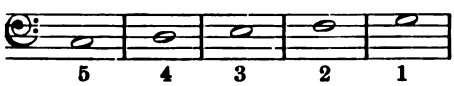


and finger 4 is released.

We must do exactly the same with the *left hand*, only we begin on the C, one octave—eight notes—below middle C,

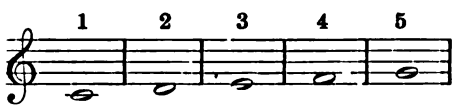


and we start with our *fifth* finger.

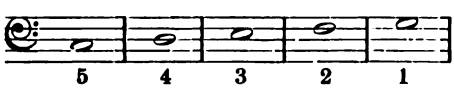


We cannot be too careful to make our fingers very free. In this exercise they must be *well lifted*, but they must never *hit* or *dig* the key, and each finger must be in the right position over its own particular key.

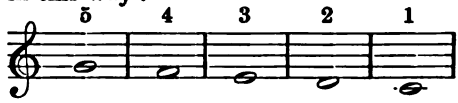
We have taken our little walk from C to G



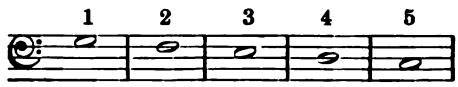
in the treble, and from C to G



in the bass. Now we just have to remember how we did it; think of all we have said, and do exactly the same thing again, only retracing our steps, in this way:



and in the left hand:



We must be quite sure to count 1, 2, 3, 4 to each note, because they are all semibreves, and every semibreve contains four crotchets, does it not?

Then counting must be *very slow*. The great "tone-poet," Schumann, told his pupils that "slow practice was golden," but quick practice he could only liken to lead. The reason is very plain; there is so much to think about, so much to which we must listen, so much to watch, but the great thing of all is to listen. We must *hear* that the tone produced is beautiful, and that there is not the slightest suspicion of harshness or hardness. Freedom is the fairies watchword, and if there is the *least* stiffness in arm, hand, or finger, we may be quite sure there will be no beauty of tone.

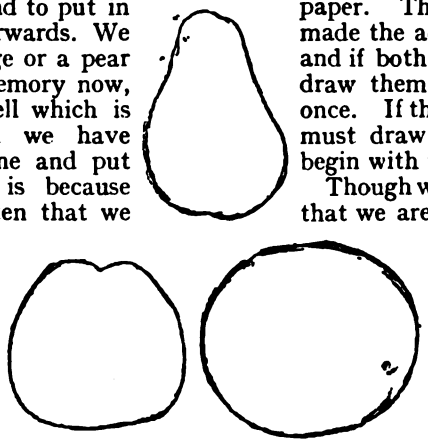
Here is the story of a persevering, painstaking little boy who grew to be a very wonderful musician. His name was Johann Sebastian Bach. He lost his father and mother when he was only ten years old, so he had to live with his eldest brother, who taught him music. Little Sebastian proved to be so clever that his brother became quite jealous of him. There was a manuscript collection of music which Sebastian wanted to have, but his unkind brother kept it locked away. However, our little friend was determined not to be daunted; the manuscript was locked away in a cupboard, but he succeeded in dragging it through the latticed door, and every night for six months, by the light of the moon, he copied the music he so longed to make his own.

The brother found out what the little one had done, and after so much persevering work took the copy away from him, and Sebastian had to wait till after his cruel brother's death before the precious copy became his very own.

DRAWING FROM MEMORY

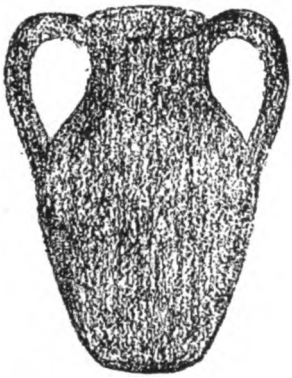
HERE we are going to learn something about memory drawing that will help us.

When we draw flowers, we find they change very quickly, quicker than we can draw them, and on page 341 we learned how to draw or block in the general shape first, and to put in the smaller parts afterwards. We can all draw an orange or a pear or an apple from memory now, so that people can tell which is which, even though we have drawn only an outline and put in no colour. This is because we see the fruit so often that we know the shape by heart. If we want to draw something we do not know so well, we must first look at it very carefully, and in a special way.



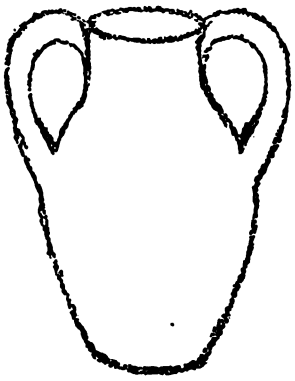
A crayon drawing of a pear, an apple, and an orange

We will choose for our first attempt a vase to practise with. The vase can be a pretty shape, and it may have handles, but we do not want it to have much decoration. We will use brown paper and white chalk first, and afterwards white paper and charcoal. We will put the vase on the table and look first at the general shape. Has it both sides alike? Is the neck wider than the base? We can see, by measuring with the pencil at arm's length, if the height of the vase is greater or less than its width, and how much more or less.



A vase drawn in charcoal on white paper

Then we look at the handles to see if they come half-way down the vase, or a third part, or more or less. In noticing the shape of the curves, it is a good plan to draw them in the air with the finger. Now we must hide the vase, and with the white chalk on the brown paper make the shape as well as we can, and very quickly, by rubbing the chalk sideways, as we did in our very first lessons. Then we must look at the vase again to see where we have made mistakes, and then, hiding it once more, try a charcoal outline on the white paper. The drawing should be made the actual size of the vase, and if both sides are alike we can draw them with both hands at once. If the sides are different we must draw with one hand, and begin with the left-hand side.



A vase drawn in white chalk on brown paper

Though we draw best the things that we are always seeing, it is a very long time before we are able to draw animals and men and women; they move so constantly, and change with every movement, so that we must be very clever before we can make our drawings of them look right. It is best to take a good look at one position, and draw that without looking at the model again, because, if we do, we shall want to rub out what we have done, and put in the new position. It is best to make a number of little sketches, one after the other.

Men and women are more difficult still. Little children generally make their heads too big, and the arms too short. The proportion of the head to the body must be noticed, and how far the arms come down towards the knee. We shall find it a very great help to use the pencil measurements at arm's length to get the size of each part in proportion to the other. If we are not careful about this, our drawings will be like caricatures.

LITTLE PICTURE-STORIES IN FRENCH

First line: French. Second line: English words. Third line: As we say it in English.

Il y avait une fois une petite fille qui avait une belle poupée.
It there had a time a little girl who had a beautiful doll.
Once upon a time there was a little girl who had a beautiful doll.

Cette petite fille avait un frère et ils jouaient ensemble toute la journée.
This little girl had a brother, and they played together all the day.
This little girl had a brother, and they used to play together all day.

Un jour ils querellèrent. "Je casserai votre poupée," s'écria le garçon.
One day they quarrelled. "I will break your doll," himself cried the boy.
One day they quarrelled. "I will break your doll!" cried the boy.



La petite fille fondit en larmes, et elle berça la poupée dans ses bras.
The little girl burst in tears, and she rocked the doll in her arms.
The little girl burst into tears, and rocked the doll in her arms.

"Si vous blessez ma poupée je ne vous parlerai plus jamais," dit elle.
"If you hurt my doll I (not) to you will speak more never," said she.
"If you hurt my doll I will never speak to you again," said she.

Le matin la petite fille courut à la chambre des enfants.
The morning the little girl ran to the room of children.
In the morning the little girl ran to the nursery.

Elle alla au berceau, mais il était vide. La poupée était partie!
She went to the cradle, but it was empty. The doll was departed!
She went to the cradle, but it was empty. The doll had gone!



"Ce mauvais garçon l'a prise," s'écria-t-elle frappant du pied.
"That bad boy it has taken," herself cried she, stamping of the foot.
"That bad boy has taken it," she cried, stamping her foot.

A ce moment le chien bondit dans la chambre portant la poupée.
At that moment the dog bounded into the room carrying the doll.
Just then the dog bounded into the room carrying the doll.

"Le méchant!" s'écria la petite fille. "Je suis fachée que j'étais en colère."
"The naughty!" herself cried the little girl. "I am sorry that I was in anger."
"Bad dog!" cried the little girl. "I am sorry that I was angry."

THE NEXT SCHOOL LESSONS BEGIN ON PAGE 4035

THE MAN WHO CARRIED DEATH

CONTINUED FROM 3660

FORTUNATELY, the days have passed away when the majority of people thought of war as something grand and glorious. Even those who believe that war is sometimes necessary are agreed that, whatever may be the cause that leads to fighting and bloodshed between nations, war is undoubtedly one of the greatest evils that can happen to any people. And yet the annals of war tell of many great and heroic deeds—deeds not merely of fierce daring in the destruction of the enemy, but of courage and endurance in the saving of life.

During the Crimean War a gallant deed of this kind was performed by Captain William Peel, the commander of one of the British warships, whose men had landed to take part in the fighting on shore. Captain Peel and his men were sent to a certain place where the guns were keeping up a constant fire upon the enemy's position. Suddenly the ammunition was found to have given out, but a number of men at once volunteered to go and bring the ammunition to the battery, although to do so was to run into the greatest danger, as Russian shells were falling and bursting all round. At last the boxes of powder and shot were brought to the battery, and the men were hastily unpacking them, when right into their midst dropped a large shell from the Russian lines. The fuse was burning, and in a moment or two the whole battery must have been blown to pieces. The men stopped in their work, and looked at the shell as though fascinated, expecting every second that the shell would burst and destroy them.

But Captain Peel was a man of action and of the greatest presence of mind. Without a moment's hesitation, or a thought of his own safety, he rushed across the battery, seized the shell, and ran with it to the side of the battery.

The other men found their voices in a moment, and shouted: "The fuse is burning! Look out, the shell will burst!" But Captain Peel continued to run with the shell away from where the others were standing, and, raising it high above his head, hurled it over the earthworks that protected the guns.

Scarcely had the shell left his hands when it burst with a terrific crash. A moment or two later and the brave captain would have sacrificed his own life in the effort to save his men, for when the shell fell into the battery Captain Peel could easily have escaped; but his courage, energy, and presence of mind saved the whole of the band of men who were unloading the ammunition and serving the guns.

For this gallant deed Captain Peel was awarded the coveted Victoria Cross.

THE PICTURE OF A GOLDEN DEED

A YOUNG Scotch minister went one day to visit the birthplace of Thomas Chalmers in an ancient and obscure town on the Firth of Forth. When he had examined this house, he and his companion entered an inn for refreshment. The room into which he was shown had its walls covered by absurd pictures, such as shepherdesses with crooks and sailors home for the holidays. But over the mantelpiece was a picture of quite another kind, making a very strange contrast with the rest. This picture represented the gloomy interior of a cobbler's shop. The cobbler was seated on his stool—an old man with spectacles pushed up over his brow, a shoe between his knees, and a hammer in his hand. The massive forehead and firm mouth suggested strength of character and an iron resolution. But under his bushy eyebrows two of the kindest eyes in all the world beamed with benevolence on a half-circle of ragged boys and girls grouped before the old man with lesson-books in their hands. The young Scotch minister read the inscription, which told how John Pounds, a cobbler in Portsmouth, took pity on the multitude of poor ragged children left by ministers and magistrates, and ladies and gentlemen, to go to ruin in the streets; how, like a good shepherd, he gathered in the wretched outcasts; how he trained them to God and to the world; and how, while earning his daily bread by the sweat of his brow, he had rescued from misery and saved to society not less than five hundred of these children. The young minister was the famous Dr. Guthrie, and this humble picture of John Pounds led him to become the apostle of the Ragged School movement. "I felt ashamed of myself," he related afterwards. "I well remember saying to my companion: 'That man is an honour to humanity, and deserves the tallest monument ever raised within the shores of Britain.' I took up that man's history, and I found it animated by the Spirit of Him who had compassion on the multitude." John Pounds was a clever man besides, and, like Paul, if he could not win a poor boy any other way, he won him by art. He would be seen chasing a ragged boy along the quays, and compelling him to come to school, not by the power of a policeman, but by the power of a hot potato. He knew the love an Irishman had for a potato; and John Pounds might be seen running, holding one under the boy's nose, like an Irishman, very hot, and with a coat as ragged as himself. When the day comes when honour will be done to whom honour is due, we can fancy the crowd of those whose fame poets have sung, and to whose memory monuments have been raised, dividing like the wave, and, passing the great and the noble and the mighty of the land, this poor obscure old man stepping forward and receiving the especial notice of Him who said: "Inasmuch as ye have done it unto one of the least of these my brethren, ye have done it unto Me." This is an example of the great influence of a picture. In seizing upon the imagination of Dr. Guthrie, this picture became an important influence in the lives of thousands of men and women.

JOHN POUNDS, OF PORTSMOUTH

THE PICTURE THAT HELPED DR. GUTHRIE
From the painting in the possession of Sir John Kirk.

The next Golden Deeds are on page 3883.

A GREAT POEM OF BRITISH HEROISM

IN the long and glorious story of British heroism there are few chapters to match in thrilling interest the defence of Lucknow. When an immense number of the native soldiers in India rebelled against the British rule, and began that short but fierce struggle with their white masters known as the Indian Mutiny, the town of Lucknow was besieged by a great army of rebel soldiers. Within its walls Sir Henry Lawrence commanded a small force of British and loyal native soldiers, while as many more men, women, and children were there to be protected. For three terrible months the British held out against their swarming enemies, until Havelock and Outram came to their relief, on September 25, 1857. This historic episode in British history was fittingly celebrated in the following fine poem by Lord Tennyson.

THE DEFENCE OF LUCKNOW

CONTINUED FROM 3639

BANNER of England, not for a season, O banner of Britain, hast thou
Floated in conquering battle or flapt to the battle-cry!
Never with mightier glory than when we had reared thee on high,
Flying at top of the roofs in the ghastly siege at Lucknow—
Shot through the staff or the halyard, but ever we raised thee anew,
And ever upon the topmost roof our banner of England blew.

Frail were the works that defended the hold that we held with our lives—
Women and children among us, God help them, our children and wives!
Hold it we might—and for fifteen days or for twenty at most.
"Never surrender, I charge you, but every man die at his post!"
Voice of the dead whom we loved, our Lawrence, the best of the brave:
Cold were his brows when we kissed him—we laid him that night in his grave.
"Every man die at his post!" and there hailed on our houses and halls
Death from their rifle-bullets, and death from their cannon-balls,
Death in our innermost chamber, and death at our slight barricade,
Death while we stood with the musket, and death while we stoopt to the spade,
Death to the dying, and wounds to the wounded, for often there fell,
Striking the hospital wall, crashing through it, their shot and their shell.
Death—for their spies were among us, their marksmen were told of our best,
So that the brute bullet broke through the brain that could think for the rest;
Bullets would sing by our foreheads, and bullets would rain at our feet—
Fire from ten thousand at once of the rebels that girdled us round;
Death at the glimpse of a finger from over the breadth of a street,
Death from the heights of the mosque and the palace, and death in the ground!
Mine? yes, a mine! Countermine! down, down! and creep through the hole!
Keep the revolver in hand! You can hear him—the murderous mole.
Quiet, ah! quiet—wait till the point of the pickaxe be through!
Click with the pick, coming nearer and nearer again than before—
Now let it speak, and you fire, and the dark pioneer is no more;
And ever upon the topmost roof our banner of England blew.

Ay, but the foe sprung his mine many times, and it chanced on a day,
Soon as the blast of that underground thunder-clap echoed away,
Dark through the smoke and the sulphur, like so many fiends in their hell—
Cannon-shot, musket-shot, volley on volley, and yell upon yell—
Fiercely on all the defences our myriad enemies fell.
What have they done? Where is it? Out yonder. Guard the Redan!
Storm at the Water-gate! storm at the Bailey gate! storm, and it ran
Surging and swaying all round us, as ocean on every side
Plunges and heaves at a bank that is daily drowned by the tide—
So many thousands that if they be bold enough, who shall escape?
Kill or be killed, live or die, they shall know we are soldiers and men!
Ready! take aim at their leaders—their masses are gapped with our grape—
Backward they reel like the wave, like the wave flinging forward again,
Flying and fouled at the last by the handful they could not subdue;
And ever upon the topmost roof our banner of England blew.

Handful of men as we were, we were English in heart and in limb,
Strong with the strength of the race to command, to obey, to endure,
Each of us fought as if hope for the garrison hung but on him;
Still—could we watch at all points? we were every day fewer and fewer.
There was a whisper among us, but only a whisper that passed:

"Children and wives—if the tigers leap
into the fold unawares—
Every man die at his post—and the foe may
outlive us at last—
Better to fall by the hands that they love,
than to fall into theirs!"
Roar upon roar in a moment two mines, by
the enemy sprung,
Clove into perilous chasms our walls and our
poor palisades.
Rifleman, true is your heart, but be sure that
your hand be as true!
Sharp is the fire of assault, better aimed are
your flank fusillades—
Twice do we hurl them to earth from the
ladders to which they had clung,
Twice from the ditch where they shelter, we
drive them with hand grenades;
And ever upon the topmost roof our banner
of England blew.

Then on another wild morning another wild
earthquake out-tore
Clean from our lines of defence ten or twelve
good paces or more.
Rifleman, high on the roof, hidden there from
the light of the sun—
One has leapt up on the breach, crying out,
"Follow me! Follow me!"—
Mark him—he falls! Then another, and *him*
too, and down goes he.
Had they been bold enough then, who can tell
but the traitors had won?
Boardings, and raftings, and doors—an em-
brasure! Make way for the gun!
Now double charge it with grape! It is
charged and we fire, and they run.
Praise to our Indian brothers, and let the dark
face have his due!
Thanks to the kindly dark faces who fought
with us, faithful and few,
Fought with the bravest among us, and drove
them, and smote them, and slew—
That ever upon the topmost roof our banner
in India blew.

Men will forget what we suffer and not what
we do. We can fight;
But to be soldier all day and be sentinel all
through the night—
Ever the mine and assault, our sallies, their
lying alarms;
Bugles and drums in the darkness, and shout-
ings and soundings to arms,
Ever the labour of fifty that had to be done
by five,
Ever the marvel among us that one should be
left alive,
Ever the day with its traitorous death from
the loopholes around,
Ever the night with its coffinless corpse to be
laid in the ground,
Heat like the mouth of a hell, or a deluge of
cataract skies,
Stench of old offal decaying, and infinite
torment of flies,
Thoughts of the breezes of May blowing over
an English field,
Cholera, scurvy, and fever, the wound that
would not be healed,
Lopping away of the limb by the pitiful-piti-
less knife—
Torture and trouble in vain—for it never
could save us a life,
Valour of delicate women who tended the
hospital bed,
Horror of women in travail among the dying
and dead,
Grief for our perishing children, and never a
moment for grief,
Toil and ineffable weariness, faltering hopes
of relief,
Havelock baffled or beaten, or butchered, for
all that we knew—
Then day and night, day and night, coming
down on the still shattered walls
Millions of musket-bullets, and thousands of
cannon-balls—
But ever upon the topmost roof our banner of
England blew.

Hark! cannonade, fusillade! is it true what
was told by the scout,
Outram and Havelock breaking their way
through the fell mutineers?
Surely the pibroch of Europe is ringing again
in our ears!
All on a sudden the garrison utter a jubilant
shout,
Havelock's glorious Highlanders answer with
conquering cheers,
Forth from their holes and their hidings our
women and children come out,
Blessing the wholesome white faces of Have-
lock's good fusileers,
Kissing the war-hardened hand of the High-
lander wet with their tears!
Dance to the pibroch! saved! we are saved!
is it you? is it you?
Saved by the valour of Havelock, saved by the
blessing of Heaven!
"Hold it for fifteen days!" we have held it
for eighty-seven!
And ever aloft on the palace roof the old
banner of England blew.

DEATH

This great sonnet by Dr. John Donne, who was appointed Dean of St. Paul's Cathedral in 1621, may be considered in the light of the Apostle Paul's triumphant exclamation, "O Death, where is thy sting? O Grave, where is thy victory?" Death, so far from being the conqueror, will itself be laid low. How foolish of Death, then, thus the poet argues, to "swell" or pride itself upon its powers, as its strength is but an empty boast. Death itself shall die, for it is only the gateway to real life, the Life Eternal.

DEATH, be not proud, though some have
called thee
Mighty and dreadful, for thou art not so;
For those whom thou thinkest thou dost
overthrow
Die not, poor Death; nor yet canst thou kill
me.
From Rest and Sleep, which but thy picture
be,
Much pleasure, then from thee much more
must flow;
And soonest our best men with thee do go—
Rest of their bones and souls' delivery!
Thou'rt slave to fate, chance, kings, and
desperate men,
And dost with poison, war, and sickness
dwell;
And poppy or charms can make us sleep as
well
And better than thy stroke. Why swell'st
thou, then?
One short sleep past, we wake eternally,
And Death shall be no more. Death, thou
shalt die!

SALLY IN OUR ALLEY

Few songs are better known or more popular than this, supposed to be sung by the apprentice who loves his pretty Sally so dearly, although she *does* live in a humble alley. He will be true to her, too, in spite of the disagreeable neighbours, who "make game" of him and his sweetheart. Of course, Sunday is "the day that comes between a Saturday and Monday." Henry Carey, the author of this song, who died in 1743, was also a musician of some note in his day. It has been said that he wrote the English National Anthem, but the evidence in his favour is not very strong.

Of all the girls that are so smart,
  There's none like pretty Sally;
She is the darling of my heart,
  And lives in our alley:
There is no lady in the land
  That's half so sweet as Sally;
She is the darling of my heart,
  And lives in our alley.

Of all the days within the week
  I dearly love but one day,
And that's the day that comes between
  A Saturday and Monday:
Oh! then I'm dress'd in all my best,
  To walk abroad with Sally;
She is the darling of my heart,
  And lives in our alley.

When Christmas comes about again,
  Oh! then I shall have money;
I'll save it up, and box and all
  I'll give unto my honey;
And when my seven long years are out,
  Oh! then I'll marry Sally,
And then how happily we'll live!
  But not in our alley.

TO ANTHEA, WHO MAY COMMAND HIM ANYTHING

In 1674 two great English poets died—John Milton and Robert Herrick. Though the former is the more illustrious, Herrick is not unworthy to be mentioned with him. He attempted nothing on the grand scale, but in the whole realm of poetry there are few, if any, lyrics more exquisite than his. "To Anthea" is a superb example of the whole-hearted devotion of a gallant Cavalier to the lady of his love.

Bid me to live, and I will live
  Thy Protestant to be;
Or bid me love, and I will give
  A loving heart to thee.

A heart as soft, a heart as kind,
  A heart as sound and free
As in the whole world thou canst find,
  That heart I'll give to thee.

Bid that heart stay, and it will stay,
  To honour thy decree;
Or bid it languish quite away,
  And't shall do so for thee.

Bid me to weep, and I will weep
  While I have eyes to see:
And having none, yet I will keep
  A heart to weep for thee.

Bid me despair, and I'll despair,
  Under that cypress tree;
Or bid me die, and I will dare
  E'en death, to die for thee.

Thou art my life, my love, my heart,
  The very eyes of me,
And hast command of every part,
  To live and die for thee.

JENNY KISS'D ME

Leigh Hunt, throughout all the ups and downs of his long and varied career—he died in 1859, in his seventy-fifth year—seems always to have been bright and cheery. His essays rank next to those of Charles Lamb, and, though sometimes sneered at as the leader of the "Cockney School" of poets, he wrote dainty verse with such a light and happy touch that these effusions, at all events, are sure of a permanent place in any collection of English poetry. In its way, nothing could be better than the following stanza

Jenny kiss'd me when we met,
  Jumping from the chair she sat in;
Time, you thief, you love to get
  Sweets into your list, put that in!
Say I'm weary, say I'm sad,
  Say that health and wealth have miss'd me,
Say I'm growing old, but add,
  Jenny kiss'd me.

DAYBREAK

Longfellow at his best was a people's true poet, and that is the secret of his universal popularity. He is not the poet of this country or of that, but of all countries where English is read. Moreover, he is the poet of the young as well as of the old, of woman as well as of man—the poet of the home. This great popularity he owes to his gift of sweet song, to his power of expressing his thoughts in clear language, to his absence of conceit and mannerism, to his complete wholesomeness and sanity. The various aspects of the dawn are beautifully displayed in the accompanying lines.

A wind came up out of the sea,
  And said: "O mists, make room for me."

It hailed the ships, and cried: "Sail on,
Ye mariners, the night is gone."

And hurried landward far away,
Crying: "Awake! It is the day."

It said unto the forest: "Shout!
Hang all your leafy banners out!"

It touched the wood-bird's folded wing,
And said: "O bird, awake and sing!"

And o'er the farms: "O chanticleer,
Your clarion blow; the day is near."

It whispered to the fields of corn:
"Bow down, and hail the coming morn."

It shouted through the belfry tower:
"Awake, O bell, proclaim the hour!"

It crossed the churchyard with a sigh,
And said: "Not yet; in quiet lie."

THE BARGAIN

This beautiful little poem by Sir Philip Sidney, who died so heroically at Zutphen in 1586, is a choice illustration of the fanciful conceits of which English poets of the period were so fond. It is a pretty comment on the proverb that "A fair exchange is no robbery." By his prose romance of "Arcadia" Sir Philip became one of the earliest novel-writers.

My true love hath my heart, and I have his,
  By just exchange one for another given;
I hold his dear, and mine he cannot miss,
  There never was a better bargain driven:
    My true love hath my heart, and I have his.

His heart in me keeps him and me in one,
  My heart in him his thoughts and senses guides;
He loves my heart, for once it was his own,
  I cherish his because in me it bides;
    My true love hath my heart, and I have his.

LATE LEAVES

Poets often find a source of inspiration in the seasons of the year. To Walter Savage Landor the fall of the leaf has brought, in these verses, a sense of profound melancholy. No doubt the deep sadness they express corresponded with his own experiences. He had gone through a prolonged autumn in his own life, for he was eighty-nine years old when he died, in 1864. The passing of old friends was typified for him in the dying flowers and the dropping leaves; and the reunion with them was symbolised by the return of spring.

THE leaves are falling; so am I;
The few late flowers have moisture in the eye;
So have I, too.
Scarcely on any bough is heard
Joyous, or even unjoyous, bird
The whole wood through.

Winter may come. He brings but nigher
His circle (yearly narrowing) to the fire
Where old friends meet.
Let him; now heaven is overcast,
And spring and summer both are past,
And all things sweet.

THE OLD CLOAK

It is a bitter night in winter. Bell, the farmer's wife, cannot sleep for thinking of poor old Crummie, the cow, that has been such a good friend to her and her family. So she urges the farmer to get up to save "Crumbock's" life. But the goodman does not relish the prospect of leaving his warm bed to go out into the blast, and pleads that his cloak is too worn to be of use to him in such weather. He must have a new cloak, he declares. But his wife sticks to her point bravely, and at last he takes his old cloak about him, and sets out to save the cow. This subject is worked out, in dialogue form, in the fine old Scottish ballad here given, and is also, it may be added, to be found in the popular song "Tak' your auld cloak aboot ye." A few words call for explanation. "Boreas" is the north wind; "to spill" here means to perish; "flyte" is to scold; "cricke," cricket; "renne," run (the suggestion being that the coat is so dreadfully thin and threadbare that it won't bear the weight of a cricket); "ken," know; "lown," dunce, rascal; "threap," argue with some degree of bitterness.

THIS winter's weather it waxeth cold,
And frost it freezeth on every hill,
And Boreas blows his blast so bold
That all our cattle are like to spill.
Bell, my wife, she loves no strife;
She said unto me quietlye:
"Rise up, and save cow Crumbock's life!
Man, put thine old cloak about thee!"

HE

O Bell, my wife, why dost thou flyte?
Thou kens my cloak is very thin;
It is so bare and over-worn,
A crickè thereon cannot renne.
Then I'll no longer borrow nor lend;
For once I'll new apparell'd be.
To-morrow I'll to town, and spend,
For I'll have a new cloak about me.

SHE

Cow Crumbock is a very good cow;
She has been always true to the pail;
She has helped us to butter and cheese, I trow,
And other things she will not fail.
I would be loth to see her pine.
Good husband, counsel take of me:
It is not for us to go so fine—
Man, take thine old cloak about thee!

HE

My cloak it was a very good cloak,
It hath been always true to the wear;
But now it is not worth a groat—
I have had it four-and-forty year.
Some time it was of cloth in grain,
'Tis now but a sigh clout, as you may see;
It will neither hold out wind nor rain,
And I'll have a new cloak about me.

SHE

It is four-and-forty years ago
Sine the one of us the other did ken;
And we have had, betwixt us two,
Of children either nine or ten.
We have brought them up to women and men,
In the fear of God I trow they be.
And why wilt thou thyself misken?
Man, take thine old cloak about thee!

HE

O Bell, my wife, why dost thou flyte?
Now is now, and then was then.
Seek now all the world throughout,
Thou kens not clowns from gentlemen.
They are clad in black, green, yellow, and blue,
So far above their own degree.
Once in my life I'll take a view,
For I'll have a new cloak about me.

SHE

King Stephen was a worthy peer;
His breeches cost him but a crown;
He held them sixpence all too dear,
Therefore he called the tailor "lown."
He was a king and wore the crown,
And thou'se but of a low degree.
It's pride that puts this country down—
Man, take thy old cloak about thee!

HE

Bell, my wife, she loves not strife,
Yet she will lead me, if she can;
And to maintain an easy life
I oft must yield, though I'm goodman.
It's not for a man with a woman to threap,
Unless he first give o'er the plea:
As we began, so will we keep,
And I'll take my old cloak about me.

OFT IN THE STILLY NIGHT

Thomas Moore (born, 1779; died, 1852) did for the delightful Irish airs, or tunes, what Robert Burns did for so many of those of Scotland—that is, he wrote suitable words for them. The present is a much-admired example of the poet's work. Its theme is very simple. In the quiet of night, ere falling to sleep, the singer's memory brings back to him the light of other days, even the years of his long-past happy boyhood.

OFT in the stilly night,
Ere Slumber's chain has bound me,
Fond Memory brings the light
Of other days around me:
The smiles, the tears, of boyhood's years;
The words of love then spoken;
The eyes that shone—
Now dimm'd and gone;
The cheerful hearts—now broken! . . .
Thus, in the stilly night,
Ere Slumber's chain hath bound me,
Sad Memory brings the light
Of other days around me.

When I remember all
The friends, so link'd together,
I've seen around me fall,
Like leaves in wintry weather,
I feel like one who treads alone
Some banquet-hall deserted—
Whose lights are fled,
Whose garland's dead,
And all but he departed! . . .
Thus, in the stilly night,
Ere Slumber's chain has bound me,
Sad Memory brings the light
Of other days around me.

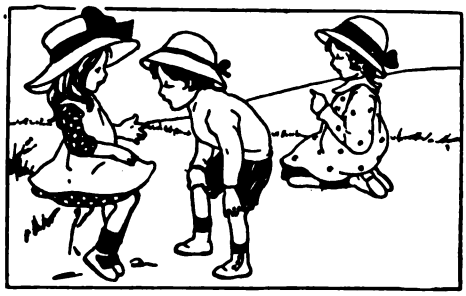
LITTLE VERSES FOR VERY LITTLE PEOPLE

LITTLE Robin Redbreast sat upon a tree;
Up went pussy cat and down went he.
Down came pussy cat, and away Robin ran;
Says little Robin Redbreast: "Catch me if you can."

A, B, C, tumble down D,
The cat's in the cupboard
And can't see me.

BYE, oh, my baby,
When I was a lady,
Oh, then my poor babe didn't cry.
But now he is weeping
For want of good keeping,
And I fear my poor baby will die.

OF all the gay birds that e'er I did see,
The owl is the fairest by far to me;
For all day long he sits on a tree,
And when the night comes away flies he.



A GIFT on the finger
Is sure to linger;
A gift on the thumb
Is sure to come!

'TWAS once upon a time,
When Jenny Wren was young,
So daintily she danced,
So prettily she sung.

Robin Redbreast lost his heart,
For he was a gallant bird.
So he doffed his hat to Jenny,
Requesting to be heard.

Cock Robin got up early,
Just at the break of day,
And went to Jenny's window
To sing a roundelay.

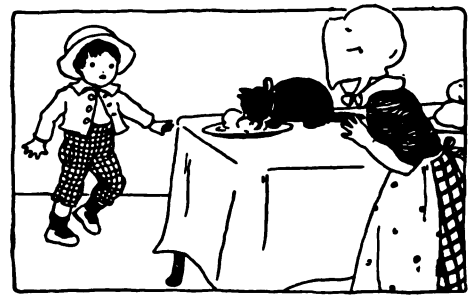
He sang Cock Robin's love
To the pretty Jenny Wren;
And when he got unto the end,
Then he began again!

FIRST the farmer sows his seeds,
Then he stands and takes his ease;
Stamps his foot and claps his hands,
And turns him round to view his lands.

TWO little dogs were basking in the cinders,
Two little cats were playing in the windows,
When two little mice popped out of a hole,
And up to a fine piece of cheese they stole.
The two little dogs cried: "Cheese is nice!"
But the two little cats jumped down in a trice,
And soon cracked the bones of the two little mice.

AS I went over the water, the water went over me;
I saw two little blackbirds sitting on a tree.
The one called me a rascal, the other called me a thief;
I took my blackthorn stick, and knocked out all their teeth.

PUSSY cat ate the dumplings,
Pussy cat ate the dumplings!



Mamma stood by, and cried, "Oh, fie!
Why did you eat the dumplings?"

THE CUCKOO AND THE JACKASS

Words by ALFRED P. GRAVES. Music by permission of MESSRS. SCHOTT & CO.

Quietly

1. The Cuc - koo and the Jack - ass fell out with ang - ry
2. The Cuc - koo cried, "I'll prove it," and raised a rous - ing
3. No strain more sweet was ev - er com - bin'd by bill and

words, Each vow - ing he sang bet - ter, Each
din; "But I can sing far bet - ter," "But
jaw In loud re - it - er - a - tion, In

sfz

vow - ing he sang bet - ter, Than all the oth - er
I can sing far bet - ter," The Ass kept chim - ing
proud re - it - er a - tion; "Cuc - koo! cuc - koo! ee -

birds,..... Than all the oth - er birds.
in..... The Ass kept chim - ing in.
aw!"..... "Cuc - koo! cuc - koo! ee - aw!"

CHILD AND MOTHER

O Mother - My - Love, if you'll give me your hand,
And go where I ask you to wander,
I will lead you away to a beautiful land—
The Dreamland that's waiting out yonder.
We'll walk in the sweet posie garden out there,
Where moonlight and starlight are streaming,
And the flowers and the birds are filling the air
With the fragrance and music of dreaming.

There'll be no little tired-out boy to undress,
No questions or cares to perplex you;
There'll be no little bruises or bumps to caress,
Nor patching of stockings to vex you.
For I'll rock you away on a silver-dew stream,
And sing you to sleep when you're weary;
And no one shall know of our beautiful dream
But you and your own little dearie.

And when I am tired I'll nestle my head
In the bosom that's soothed me so often;
And the wide - awake stars shall sing in my stead
A song which our dreaming shall soften.
So, Mother - My - Love, let me take your dear hand,
And away through the starlight we'll wander,
Away through the mist to the beautiful land—
The Dreamland that's waiting out yonder.

DOCTOR FAUSTUS was a good man,
He whipped his scholars now and then.
When he whipped them he made them dance,
Out of Scotland into France,
Out of France into Spain,
And then he whipped them back again!

JOHN COOK had a little grey mare; he, haw, hum!
Her back stood up, and her bones they were bare; he, haw, hum!

John Cook was riding up Shunter's bank; he, haw, hum!
And there his nag did kick and prank; he, haw, hum!

John Cook was riding up Shunter's Hill; he, haw, hum!
His mare fell down, and she made her will; he, haw, hum!

The bridle and saddle were laid on the shelf; he, haw, hum!
If you want any more you may sing it yourself; he, haw, hum!

I DO not like thee, Doctor Fell;
The reason why I cannot tell.
But this I know, and know full well,
I do not like thee, Doctor Fell.

"WE are three brethren out of Spain,
Come to court your daughter Jane."
"My daughter Jane she is too young;
She has no skill in a flattering tongue."

"Be she young, or be she old,
It's for her gold she must be sold;
So fare you well, my lady gay,
We'll call again another day."

"Turn back, turn back, thou scornful knight,
And rub thy spurs till they be bright."
"Of my spurs take you no thought,
For in this land they were not bought.
So fare you well, my lady gay,
We'll call again another day."

"Turn back, turn back, thou scornful knight,
And take the fairest in your sight."
"The fairest maid that I can see
Is pretty Nancy. Come to me!"

IF you are to be a gentleman, as I suppose you be,
You'll neither laugh nor smile for a tickling of the knee.

BUTTONS, a farthing a pair,
Come, who will buy them of me?
They're round and sound and pretty,
And fit for the girls of the city.
Come, who will buy them of me,
Buttons, a farthing a pair?

MASTER I have, and I am his man,
Gallop a dreary dun ;
Master I have, and I am his man,
And I'll get a wife as fast as I can ;
With a heighty gaily gamberally,
Higgledy, piggledy, niggledy, niggledy,
Gallop a dreary dun.

ROCK-A-BY, baby, thy cradle is green ;
Father's a nobleman, mother's a queen ;
And Betty's a lady, and wears a gold ring ;
And Johnny's a drummer, and drums for the king.

TWO Robin Redbreasts built their nest
Within a hollow tree ;
The hen sat quietly at home,
The cock sang merrily ;
And all the little ones said :
" Wee, wee, wee, wee, wee, wee."

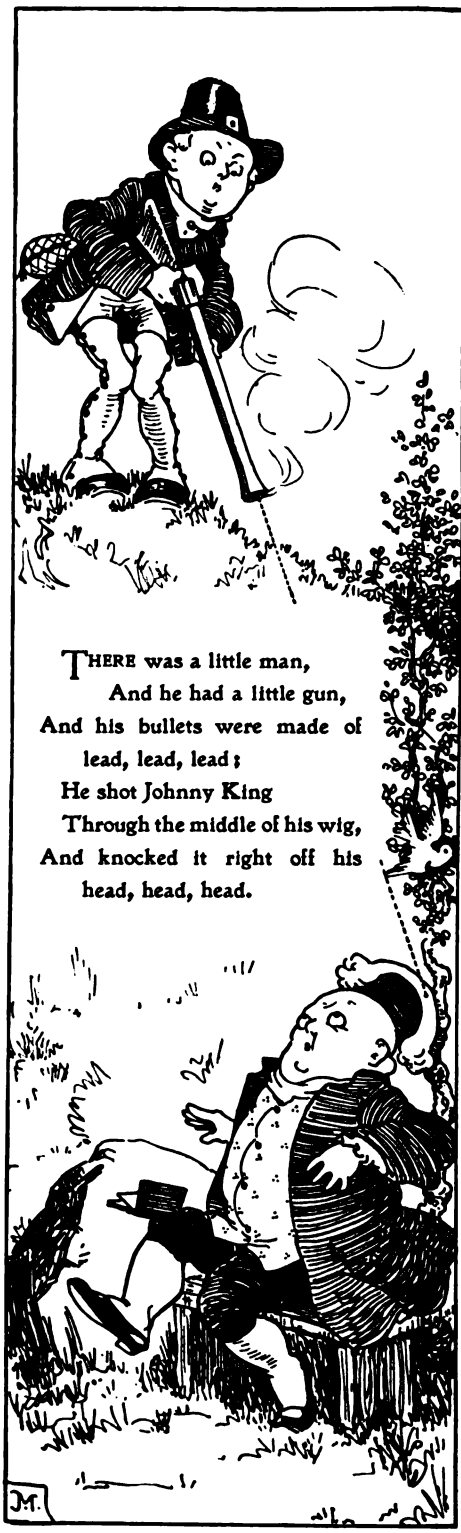
One day the sun was warm and bright,
And shining in the sky,
Cock Robin said : " My little dears,
'Tis time you learned to fly."
And all the little young ones said :
" I'll try, I'll try, I'll try."

I know a child, and who she is
I'll tell you by and by,
When Mamma says " Do this," or " that,"
She says " What for ? " and " Why ? "
She'd be a better child by far
If she would say " I'll try."

UPON St. Paul's steeple stands a tree,
As full of apples as may be ;
The little boys of London Town,
They run with hooks and pull them down ;
And then they run from hedge to hedge,
Until they come to London Bridge.

AROUND the green gravel the grass grows green,
And all the pretty maids are plain to be seen ;
Wash them with milk, and clothe them with silk,
And write their names with a pen and ink.

CUSHY cow, bonny, let down thy milk,
And I will give thee a gown of silk;
A gown of silk and a silver tee,
If thou wilt let down thy milk to me.



THERE was a little man,
And he had a little gun,
And his bullets were made of lead, lead, lead ;
He shot Johnny King
Through the middle of his wig,
And knocked it right off his head, head, head.

DOWN AMONG THE WATER-BABIES

There were two kind fairy sisters who looked after the water-babies. One was Mrs. Bedonebyasyoudid, and she was ugly and would remain ugly until people behaved properly. The other was Mrs. Doasyouwouldbedoneby, and she was ever so pretty. She kissed and cuddled little Tom at first, but once when she came she wouldn't pet him, as he had grown rough and was beginning to get a prickly skin, the reason for which will soon appear.

THE STORIES OF CHARLES KINGSLEY

WE have read Kingsley's best-known novel, "Westward Ho!" and we are now to read a story of a very different kind, also written by him. "The Water-Babies" is a fairy story, and something more. It is an attempt to teach us a great deal about nature and human life and character in the form of a fanciful story. Fairy tales are not supposed to have "morals," and that is where Kingsley's story is different from other fairy tales; but here we are chiefly concerned with the story, which is an extremely pretty one. "The Water-Babies" was originally written to amuse and instruct one of the author's own children, a little boy, and it has entertained multitudes of children, old and young, since it was first printed.

THE WATER-BABIES

BEING A FAIRY TALE FOR A LAND-BABY

CONTINUED FROM 3668

ONCE upon a time there was a chimney-sweep, and his name was Tom. He was ten years old, and he lived in a great town in the North Country, where there were plenty of chimneys to sweep, and lots of money to earn for his drunken master. It was in the days when little boys were employed to go up the chimneys and clean them out. Little Tom had never been taught to read or write, and he was as ignorant and as dirty as a boy could possibly be. He never even washed himself. Altogether, he lived a very miserable and hopeless life in the dirty house of Mr. Grimes, the sweep.

One day Mr. Grimes was sent for by Sir John Harthover to come to his fine mansion, Harthover Place, and clean all the chimneys there. Mr. Grimes was so delighted at this fine job that he expressed his joy by knocking Tom down and drinking twice his usual quantity of beer that night.

They were up very early next morning, and Tom's master knocked him down again, just to remind him that he was expected to be an extra good boy that day. On the way to Harthover Place, Mr. Grimes riding on his donkey and poor Tom trudging behind with the brushes, they came upon an old Irishwoman, limping slowly along and carrying a heavy bundle. Although it was not yet five o'clock in the morning, she already seemed to be footsore and weary, so that even the heartless Grimes went so far as to offer her a lift beside him on his donkey. She declined this invitation, saying she would sooner walk with Tom. Grimes growled in reply that she might do as she pleased, and went on smoking.

As Tom and the Irishwoman went along, she asked him many questions about himself, and seemed very sad when he told her that he knew no prayers to say. She told him that she lived far away by the sea, and that although it rolled and roared on winter nights it lay still on the bright summer days, so that the children could bathe in it. Her stories of the sea were so wonderful to poor little Tom that a great longing to look upon it sprang up in him. He, too, would like to bathe and be clean.

When, at length, they came to a spring, near which the Irishwoman and Tom picked some flowers, Grimes got off his donkey, to refresh himself by dipping his head in the water. Because Tom followed his example, his master was displeased with him, and immediately thrashed him again.

"Are you not ashamed of yourself, Thomas Grimes?" said the Irishwoman, when he was belabouring Tom.

Grimes looked up, startled at her knowing his name; but his only answer was: "No; nor never was yet," and he went on beating Tom.

"True for you. If you ever had been ashamed of yourself, you would have gone into Vendale long ago."

"What do you know about Vendale?" shouted Grimes; but he left off beating Tom.

"I know about Vendale and about you, too. I know, for instance, what happened in Aldermire Copse by night, two years ago come Martinmas."

THE LAME IRISHWOMAN WHO MYSTERIOUSLY DISAPPEARED FROM SIGHT

At this, Grimes, who had been growing so angry that Tom was afraid he might strike the poor Irishwoman, was so cowed by her words—for she evidently knew something for which he could have been imprisoned—that he got on his donkey again without saying anything more. As they neared the great iron gates at the end of the splendid avenue that led to Harthover Place, the Irishwoman took her leave of Grimes and Tom, by disappearing before their eyes, after she had said:

"I have one more word for you both; for you both shall see me again, before all is over. Those that wish to be clean, clean they will be; and those that wish to be foul, foul they will be. Remember!"

After this we may suppose that Mr. Grimes was in none too good a temper when he arrived at the mansion, where nearly all the inmates, except a few of the servants, were still asleep. There were a great many chimneys to be swept, and due preparations had been made for this, the carpets of the rooms that needed attention being covered over with brown paper round the fireplaces.

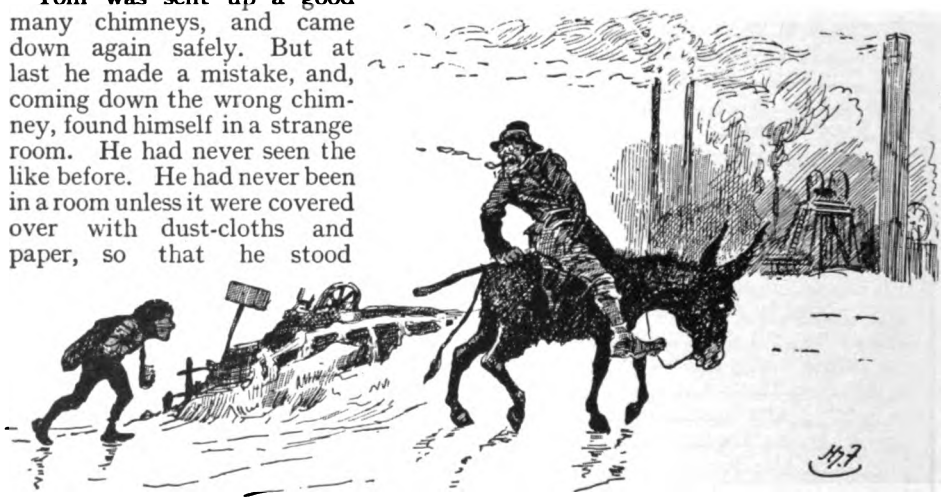
Tom was sent up a good many chimneys, and came down again safely. But at last he made a mistake, and, coming down the wrong chimney, found himself in a strange room. He had never seen the like before. He had never been in a room unless it were covered over with dust-cloths and paper, so that he stood bewildered in this prettiest of bedrooms, where everything was white. There were white window-curtains, white bed-curtains, white furniture, and white walls, and just a few lines of pink here and there. There was a washhand-stand, with ewers and basins, and soap and brushes and towels; and a large bath full of clean water. What a heap of things—all for washing!

"She must be a very dirty lady," thought Tom, "to want as much scrubbing as all that. But she must be very cunning to put all the dirt out of the way so well afterwards, for I don't see a speck about the room, not even on the very towels."

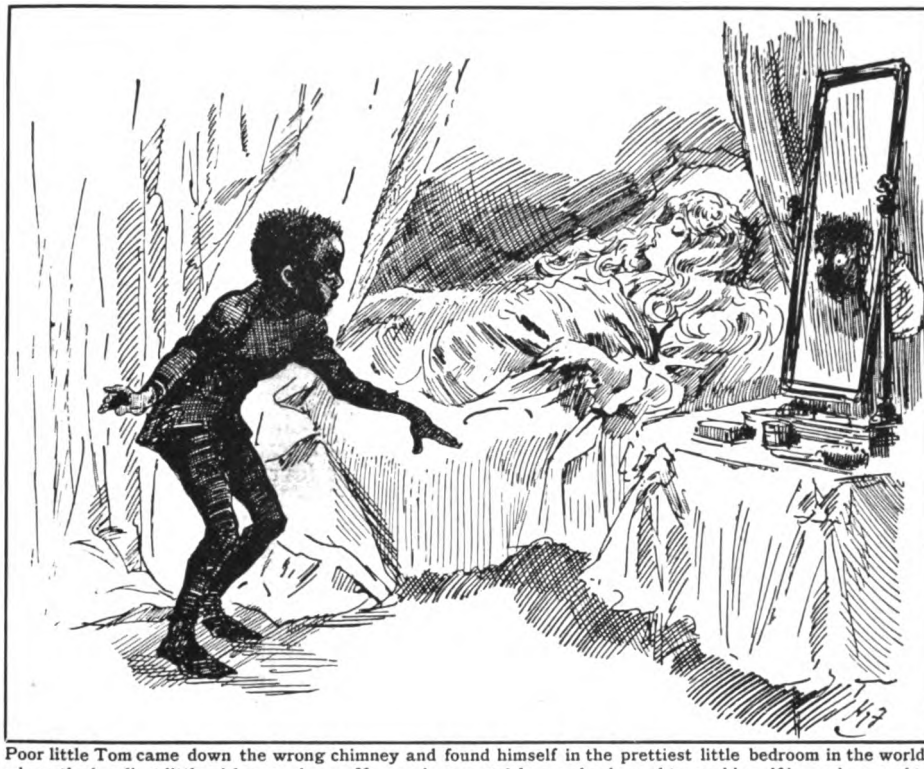
Just then he happened to look towards the bed, and there lay the most beautiful little girl Tom had ever seen. He wondered whether all people were as white as she when they were washed. He felt certain that she could never have been very dirty at any time. Thinking of this, he tried to rub some of the soot from his own wrist, and thought, perhaps, he might look better himself some day if he were clean.

WHAT HAPPENED TO TOM IN THE PRETTY BEDROOM, AND WHY HE FLED

Suddenly, looking around, he saw standing close to him a little, ugly, black, ragged figure, with bleary eyes and grinning, white teeth. His first impulse was to drive this little black ape away from the clean room of the sweet little lady; but when he looked again, and found it was his own reflection in the



GRIMES, THE CHIMNEY-SWEEP, SETS OUT FOR HARTHOVER, WITH TOM TRUDGING BEHIND



Poor little Tom came down the wrong chimney and found himself in the prettiest little bedroom in the world, where the loveliest little girl was asleep. He was horror-stricken and ashamed to see himself in a mirror and to discover how dirty he was. In hastening back to the chimney he made such a noise among the fire-irons that the **girl awoke and called for her nurse, who soon came into the room; and thus began Tom's wonderful adventures.**

mirror, he was so overwhelmed with shame that he hurriedly turned to the chimney again to make his escape.

In doing so, however, he upset the fender with such a clatter as to waken the little girl. On seeing Tom, she screamed loudly, and her nurse came running in, just in time to catch him by the jacket. But he was able to wrench himself away, and jumping from the window into a tree close by, he slid down to the ground and ran off across the park, while the nurse very stupidly continued to scream "Murder!" and "Fire!" at the open window.

Now began a most exciting chase. Surely there never was a dirty little boy pursued at once by so many different people. The under-gardener, the dairy-maid, the groom, the steward, the ploughman, the keeper, Grimes, and even Sir John himself, all took part in the chase after Tom. The Irishwoman joined in it too, and, curiously enough, although she had seemed to be so lame on the highway earlier in the morning, she was now the only one that Tom could not shake off. Perhaps this was because he did not see her!

He had gained the high and open moor behind Harthover, and down in a narrow green valley he could see a cottage and a garden. His mind was so excited with all the events of the morning that he fancied he could climb down into the garden in five minutes. But the cottage was really a mile away, and a thousand feet below him. Little Tom, however, was brave enough to make the long and dangerous descent down the face of the hill, and all the time the Irishwoman, whom he did not see, was following him.

When, at length, he managed to reach the cottage, the door of which was all hung round with clematis and roses, he peeped in, half afraid. There, by the empty fireplace, which was filled with a pot of sweet herbs, sat the nicest old woman that ever was seen, in a red petticoat and short dimity bed-gown, and a clean white cap, with a black silk

handkerchief over it, tied under her chin. At her feet sat the grandfather of all the cats, and opposite her, on two benches, sat twelve or fourteen neat, rosy, chubby little children, learning their Criss-cross row, and gabble enough they made about it, to be sure.

TOM'S PLUNGE INTO THE RIVER, AND HOW HE BECAME A WATER-BABY

When Tom ventured to step into the cottage, his dirty little figure caused a great commotion among the chubby little children. At first the old woman would have turned him out, but when Tom pleaded that he was faint for lack of food and drink, her kind heart was touched, and, giving him some bread and milk, she took him to an outhouse where, on some soft hay, he could rest quite snugly. She promised to come to him an hour later, when school was over, and then left him.

Tom did not fall asleep at once, for he could hear the pleasant noise of the stream that ran close by, and, as he lay, half asleep and half awake, the thought that rose uppermost in his mind was: "How to be clean." People would never let him enter any decent place in his dirty state; he could never see inside a church—and he wished very much to see inside one—unless he were cleaned. "I must be cleaned, I must be cleaned," he kept saying aloud; and, half awake, he found himself out of the house and in the meadow, making for the stream, where, pulling off his ragged clothes, he plunged into the cool water.

Just before Tom had taken this cold plunge, the Irishwoman had stepped into the stream and changed into the most beautiful of fairies underneath the water. For she was, indeed, the Queen of the Water-Fairies, who were all waiting to receive her the moment she came back from the land-world.

WHY SHOULD THERE NOT BE WATER-BABIES AS WELL AS LAND-BABIES?

She told them that she was bringing a new brother to them, but, as he was still quite a little savage, and needed to be taught good conduct, he was not to see or know them for some time, though they were to watch over him and see that he came to no harm.

Meanwhile, of course, the chase after Tom had come to an end, although Sir John and his keepers made a second search the next day, as he felt sorry for the little sweep, and was afraid he might have fallen over some of the crags. The old dame at the cottage found he had vanished at the end of the hour, and, for a moment, was inclined to doubt the truth of his story; but when Sir John and the keepers arrived at her house, she knew that Tom had told the truth. They found the little fellow's rags by the side of the stream, and they also discovered his body in the water, and buried it over in Vendale churchyard, where the old dame used to go on Sunday to place flowers on the little grave. They were quite certain that Tom was dead.

But all the time Tom was swimming about in the stream, although he was now only about four inches long, with a set of external gills, just like those of an eft. The fairies had transformed him into a water-baby, and the body that had been found and buried was only the disused shell of him. There are land-babies, and why not water-babies? Some people tell us that water-babies are contrary to nature, but there are so many things in nature which we don't expect to find that there may just as well be water-babies as not.

TOM'S EARLIEST ADVENTURES AMONG THE CREATURES OF THE WATER-WORLD

Tom was extremely happy swimming about there in the river. He had even forgotten that he used to be so dirty. But he remembered how much he had been overworked in the land-world, and meant to make up for it by having nothing but holidays in the water-world for a long, long time to come.

He was still as mischievous as any land-baby, and made himself a perfect nuisance to the other creatures of the water, teasing them as they went about their work, until they were all afraid of him, and got out of his way, or crept into their shells; so that he had no one to speak to or to play with.

It was from a dragon-fly that he learned some valuable lessons in good conduct. For all his short sight, the dragon-fly had noticed a great many interesting things in nature, about which Tom knew nothing, and of which he heard with wonder. One day he might have been eaten by an otter, which was fully under the impression that Tom was only a common eft; but, behold, seven little terrier dogs rushed at the

otter, and drove her off, much to Tom's relief, though he did not guess that these were really water-fairies sent to protect him.

But before the otter had been headed off by the approach of the water-fairies, she had twitted Tom with being only an eft, and told him he would be eaten by the salmon when they came up from the sea—the great wide sea. Tom himself decided he would go down the stream, and discover what the great wide sea was like. On the way he met a great many salmon coming up, and warned them against the wicked old otter who had boasted to him that the otters were the lords of the salmon, and found them good to eat.

One night he saw men spearing the salmon, and some other men set upon them. There was a fight on the bank of the stream, and a man fell into a deep pool, and sank to the bottom, where he lay. Tom recognised him as his old master, Grimes. He expected him to turn into a water-baby, as he had done himself; but there he lay quite still at the bottom of the pool, and never went poaching salmon any more.

Every creature in the stream seemed to be hurrying down to the sea, and Tom, being the only water-baby among all the squirming eels and the scores of different things, big and little, we may guess that he had many strange adventures before he came to the sea. But great was his disappointment to find no water-babies there to play with, though he asked the sea-snails, and the hermit-crabs, and the sun-fish, and the bass, and the pollock, and the porpoises. But though one fish told him that he had been helped the previous night by the water-babies, Tom could find no trace of them at all.

We are to remember that, although he was a water-baby, he was also amphibious, which means that he could live on the land as well as in the water; so that at nights he took to playing

THE FRIGHTFULLY WISE OLD PROFESSOR AND THE WATER-BABY

One day little Ellie was at the seashore with a frightfully wise old professor, who said there were no such things as water-babies. Just then he caught one, and it was Tom! But the professor wouldn't admit it was a water-baby, and when Tom escaped from him, Ellie tried to catch him, but slipped and injured herself.

about among the rocks on the seashore, and there, one day, a funny thing happened to him. Lady Harthover, whose little daughter Tom had frightened the day he came down the wrong chimney, had come down to stay at the seaside with Ellie for a holiday. The little girl often went for walks along the shore with a very kind, good-natured, little, old gentleman, named Professor Ptthmllnsprcs, which is a very ancient and noble Polish name. He was professor of Necrobioneopalaeonthydrochthomanthropopithekology in the university which the King of the Cannibal Islands had founded, and had come to collect strange specimens from the seashore.

Little Ellie believed there were water-babies, but the frightfully wise old professor assured her that such ideas were all nonsense, although, after he had entered into long explanations which explained nothing, all he could say in reply to Ellie's question, "Why are there no water-babies?" was "Because there ain't," which was neither very grammatical nor very polite.

How Tom was caught in a net, and how he escaped again

Just as he said this, he was groping with his net among the seaweed, and caught Tom in the meshes.

"Dear me!" he cried. "What a large pink Holothurian; with hands, too! It must be connected with the Synapta." And he took him out.

"It actually has eyes!" he cried. "Why, it must be a Cephalopod! This is most extraordinary!"

"No, I ain't!" cried Tom, as loud as he could; for he did not like to be called bad names.

"It is a water-baby!" cried Ellie; and of course it was.

"Water-fiddlesticks, my dear!" said the professor; and he turned away sharply. But there was no denying it. It was a water-baby; and he had said, a moment ago, that there were none. What was he to do?

It was, in a way, fortunate for the professor that, when he poked Tom with his finger, the water-baby bit him so smartly that he was glad to drop him on to the seaweed, whence Tom dived into the water, and was gone in a moment. Little Ellie, in her desire to have the pretty little water-baby, tried to catch Tom before he disappeared into the sea, but, slipping on the rocks, she hurt herself so badly that she had to be carried away and taken home, where one night the fairies came along the moonbeams, bringing with them a pair of wings, with which beautiful little Ellie flew away in their company.

Tom has an exciting time with his friend the lobster

Now, when Tom had been picked up by the professor, he had recognised little Ellie, and wished so much that she could have been his playmate. But soon, as he was going along at the bottom of the sea, he came across a poor old lobster, with whom he had been friendly, caught in a lobster-pot. He tried to help him out, in doing which he nearly came to grief from the otter, who came along and accused him of having warned the salmon against her.

As it was, however, the otter got the worst of it in the fight that took place between the lobster and herself in the lobster-pot; and Tom was afraid his friend the lobster was going to be caught, when he saw the pot being pulled up. He escaped from it himself in time, and was delighted to see the lobster manage to snap away from it at the last moment, even at the cost of leaving one of his claws behind him, which, of course, was only a temporary inconvenience, as it would grow again.

And now a most wonderful thing happened to Tom, for he had not left the lobster five minutes before he came upon a water-baby. A real live water-baby, sitting on the white sand, very busy about a little point of rock. And when it saw Tom it looked up for a moment, and then exclaimed with delight: "Why, you are not one of us! You are a new baby! Oh, how delightful!"

Tom gets to know other water-babies at last

And it ran to Tom, and Tom ran to it, and they hugged and kissed each other for ever so long; they did not know why. But they did not want any introductions there under the water.

At last Tom said: "Oh, where have you been all this while? I have been looking for you so long, and I have been so lonely."

"We have been here for days and days. There are hundreds of us about the rocks. How was it that you did not see us or hear us when we sang and

romped about the rocks and sand every evening before we went home?"

Tom looked at the baby again, and then he said:

"Well, this is wonderful! I have seen things just like you again and again, but I thought you were shells or sea-creatures. I never took you for water-babies like myself."

Now, was not this very odd? So odd, indeed, that you will, no doubt, want to know how it happened, and why Tom could never find a water-baby till after he had got the lobster out of the pot. But if you will read this story nine times over, and then think for yourself, you will find out why. It is not good for little boys to be told everything and never to be forced to make use of their own wits.

Tom grew prickly all over just because he did things for which his conscience pricked him, and he was sent to be taught by Ellie, the new water-baby, how he might manage to become smooth again.

"Now," said the baby, "come and help me, or I shall not have finished before my brothers and sisters come, and it is now time to go home."

"What shall I help you at?"

"At this poor, dear little rock. A great clumsy boulder came rolling by in the last storm, and knocked its head off and rubbed off all its flowers. And now I must plant it again with sea-weeds, and coralline, and anemones; and I will make it the prettiest little rock-garden on all the shore."

So they worked away at the rock and planted it, and smoothed the sand down round it, and capital fun they had till the tide began to turn. And then Tom heard all the other babies coming, laughing and singing and shouting and romping; and the noise they made was just like the noise of a ripple. So he knew he had been hearing and seeing the water-babies all along, only he did not know them, because his eyes and ears were not opened.

And in they came, dozens and dozens of them, some bigger than Tom, and some smaller, all in the neatest little white bathing-dresses; and when they found that he was a new baby, they hugged him and kissed him and then put him in the middle and danced round him on the sand. And there was no one ever so happy as poor little Tom.

He gaily swam away with them to their home in the caves beneath St. Brandan's fairy isle; but he was still a naughty little water-baby, given to amusing himself by tormenting the anemones, the crabs, and other odd creatures of the sea, and paying no heed to the warning of the water-babies, who said: "Take care what you are at, as Mrs. Bedonebyasyoudid is coming back."

Early one Friday morning this tremendous lady indeed came, and when the water-babies saw her they all stood in a row, and smoothed down their bathing-dresses, and put their hands behind them, just as if they were going to be examined by an inspector.

Mrs. Bedonebyasyoudid was very ugly, and had a pair of large green spectacles on her great hooked nose. But she was very good to the water-babies, and gave them all some sea-sweets because their conduct had pleased her. Tom was very much disappointed when it came to his turn, as she popped a nasty, cold, hard pebble in his mouth, at which he began to whimper. So she reminded him that he had been cruel to the anemones by dropping pebbles into their mouths

and making them think for a moment that they had caught a good dinner.

"As you did to them, so I must do to you," said Mrs. Bedonebyasyoudid.

She also told him that it was quite useless for him to try to hide his actions from her, as she knew everything that the water-babies did, and could not help punishing those who did wrong.

WHAT TOM WAS TOLD BY MRS. BEDONEBYASYOUDID

She told him, too, that she was the ugliest fairy in the world, and would have to remain so until people behaved themselves properly, when she would grow as beautiful as her sister, Mrs. Doasyouwouldbedoneby.

"Now all of you run away, except Tom," she said; "and he may stay and see what I am going to do. It will be a very good warning for him to begin with before he goes to school."

Then she called up all the doctors who had given little children too much physic, and she made them take their own medicines, such as salts and senna, and brimstone and treacle, to say nothing of pulling out their teeth. Then she called up all the careless nursemaids, and stuck pins into them all over, and wheeled them about in perambulators, with tight straps across their stomachs and their heads and arms hanging over the sides. After luncheon she punished all the cruel schoolmasters, and altogether she had a very exciting and exhausting day. All this had to be done every Friday, so we can see that her job was by no means an easy one. But people cannot always choose their own professions.

It was on Sunday that the ugly fairy's beautiful sister visited the water-babies, who were all delighted to see her.

HOW TOM WAS STRANGELY PUNISHED BY HIS OWN CONSCIENCE

To Tom in particular she was very kind, and petted him a great deal; but this did not make him a better water-baby, for he had now grown so fond of the sweet things Mrs. Bedonebyasyoudid kept in a secret store, that he searched out her hiding-place and ate as many as he could.

Of course, the fairy knew what he had done, but she was more sorry than angry with the little fellow, and said nothing about it next time, giving him his share with the rest. She left it to his conscience to punish him, and that did its work in a very curious way. When Sunday had come round again, and Mrs. Doasyouwouldbedoneby had come back, Tom was very anxious to be petted and cuddled by the beautiful fairy, but she said she could not do so, for, since her last visit, he had grown horny and prickly all over his body. And it was as she said. Just as his conscience had been pricking him on account of his wrong-doing, his body, too, had become as prickly as some of the sea-shells.

Tom could now see that the best thing to do was to confess to Mrs. Bedonebyasyoudid next Friday, and leave her to deal with him. This she did very gently, forgiving him for his naughtiness, and promising to send him a schoolmistress who would teach him how to get rid of his prickles. Who should this schoolmistress prove to be but little Ellie, who was now one of the most beautiful of the water-babies, and she came to know by-and-by that her little pupil had been the chimney-sweep who frightened her ever so long ago.

TOM'S WONDERFUL JOURNEY TO THE OTHER-END-OF-NOWHERE

For seven whole years they studied together, but as Ellie always went away on Sundays and Tom wondered where she was, he grew discontented, and said she was tired of him. He had more reason to be discontented when she disappeared altogether, and Mrs. Bedonebyasyoudid told him it was she who had sent Ellie away. She also showed him "The History of the Doasyoulikes," people who had come away from the country of Hardwork, and what happened to them was certainly enough to frighten poor Tom.

In his new desire to win the good opinion of Mrs. Bedonebyasyoudid, he said he was ready to go to the world's end to find his old master, Mr. Grimes, who, the fairy said, was now at the Other-end-of-Nowhere. In order to get there he had first to go to Shiny Wall, and then through the White Gate that was never opened, on the way to Peace-pool and Mother Carey's Haven, where the good whales go when they die. If he ever got there, Mother Carey was to tell him how he could reach the Other-end-of-Nowhere, and find Mr. Grimes. The journey was a very, very long

one indeed. All the way Tom fell in with adventures, but there was always somebody to help him with advice. There was the King of the Herrings, for instance, who showed him the way to the Allalonestone, where he was to find the last of the Gairfowl. In due course he came up to this queer old creature, who was rather like a penguin, sitting on her stone very mournfully. She told Tom her sad story, at the end of which she wept tears of pure oil, and confessed that her poor old brains were getting quite puzzled. She really did not know the way to Mother Carey's Haven at all. But a flock of petrels came winging along, and, when they heard what Tom was wanting, they said :

" Shiny Wall ? Do you want Shiny Wall ? Then come with us. We are Mother Carey's own chickens, and she sends us out over all the seas to show the good birds the way home."

Thanks to them, Tom soon reached Shiny Wall, which was really a big iceberg, under which he had to dive and swim for seven days and seven nights in order to come to Peacepool.

TOM FINDS MOTHER CAREY AND ALSO FINDS HIS MASTER UP A CHIMNEY

There, at last, in the middle of the pool, sat Mother Carey, like a gigantic marble statue, on a throne. And from the foot of the throne there swam away, out and out into the sea, millions of new-born creatures, of more shapes and colours than man ever dreamed, and they were Mother Carey's children, whom she makes out of the sea-water all day long.

Mother Carey gave him a pass which he was to keep until he got to the Other-end-of-Nowhere, the way to which she explained to him. It was only after many other strange adventures that he arrived there, and, showing his pass, was admitted into a curious kind of castle. Here he inquired for Mr. Grimes, and was told he would find him up chimney No. 345 if he cared to go up on the roof and look for him.

Sure enough he found him there, with his head and shoulders just sticking out of the chimney, and in his mouth a pipe that would not draw. The sweep was grumbling very much, and when he saw Tom he supposed he had only come to laugh at him in his plight ; but Tom declared he only wished to help him. Mrs. Bedonebyasyoudid now appeared on the scene, and reminded Grimes that he had often treated Tom as he was now being treated himself. Tom, however, urged her to let him help his old master, and vainly tried to wipe the soot from Grimes's face.

HOW TOM GOT HIS OLD MASTER RELEASED FROM THE CHIMNEY

Tom was so sincerely anxious to help him that his efforts at last softened the hard heart of the master-sweep, who now began to think of the mother he had forsaken in his youth, and he wept over his own wrong-doing. The tears that he shed increased at such a rate that they washed the soot from his face and clothes, and then they washed the mortar away from between the bricks, and the chimney crumbled down, and Grimes began to get out of it.

" Will you obey me if I give you a chance ? " said Mrs. Bedonebyasyoudid.

" As you please, ma'am. For I'm beat, and that's the truth," said he.

" Be it so, then—you may come out. But remember, disobey me again, and into a worse place still you will go."

" I beg your pardon, ma'am, but I never disobeyed you that I know of. I never had the honour of setting eyes upon you till I came to these ugly quarters."

" Never saw me ? Who said 'Those that will be foul, foul they will be' ? "

Grimes looked up, and Tom looked up too, for the voice was that of the Irish-woman who met them the day they went out together to Harthover. She ordered Grimes to march off in the custody of a policeman, who was to see that he devoted himself to the considerable task of sweeping out the crater of Etna !

TOM RETURNS TO ST. BRANDAN'S ISLE AND MEETS ELLIE AGAIN

Tom now returned to St. Brandan's Isle, where he met Ellie, and they were ever so delighted to see each other again.

There Mrs. Bedonebyasyoudid came to them, and they tried to guess who she really was ; but they did not succeed, and she told them they would know some day. Then, turning to Ellie, smiling, she said :

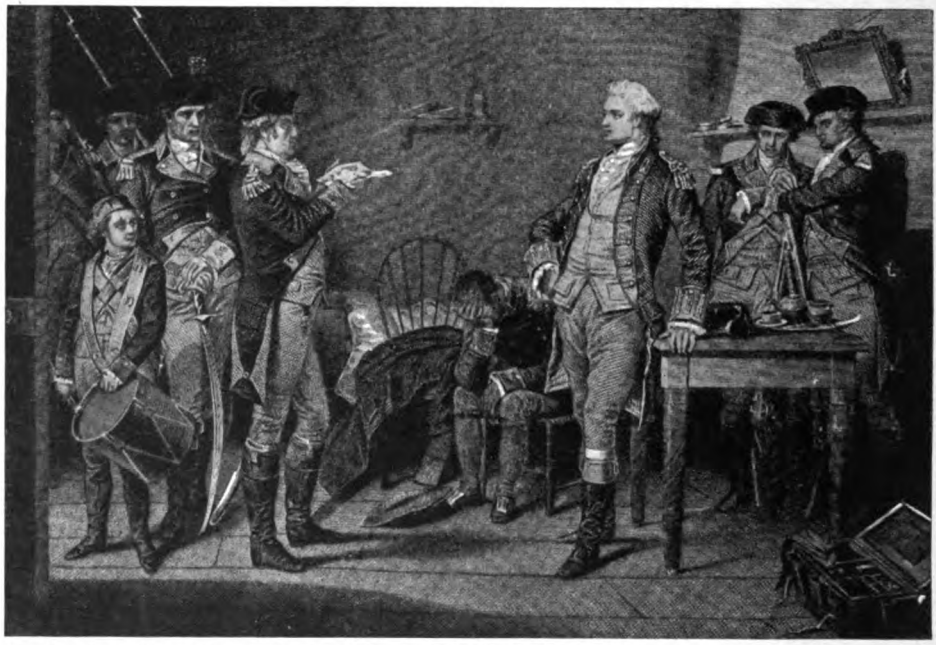
" You may take him home with you now on Sundays, Ellie. He has won his spurs in the great battle, and become fit to go with you, and be a man, because he has done the things he did not like."

The next Famous Books are on page 3923.

TWO SPIES WHOM ALL ADMIRED

This beautiful statue of Nathan Hale by Frederick MacMonnies stands in New York City where he was hanged as a spy Sept. 22, 1776.

This monument in memory of Major John Andre stands on the spot where he died Oct. 2, 1780. If your eyes are keen perhaps you can read the inscription.



The American officers who condemned Major Andre to death did so with great regret, for his bravery and dignity won all hearts, even of his enemies. Here we see him as his death warrant is being read to him. He begged that he might be shot instead of hanged, but his request could not be granted.

TWO SPIES OF THE REVOLUTION

A SPY in time of war is one who visits in disguise the territory held by the enemy for the purpose of gaining information about their plans. If he wears his uniform he is not a spy, and must be treated as a prisoner of war, but if he wears the uniform of the enemy or ordinary clothes, he is a spy and may be put to death by hanging.

Soldiers think such a death disgraceful, and yet the love of their country has always led men to risk their lives to help their commanders gain necessary information, for it is considered fair to send out spies and every army uses them when needed.

During the Revolution many spies were sent out by both sides, but two, one American and one English, have been remembered more than all the others. Both were young officers, well-educated, and lovable. Both risked their lives, were caught, and suffered disgraceful deaths while the British army held New York. Monuments have been erected to them both as you can see on another page.

NATHAN HALE, THE TEACHER AND SOLDIER

Nathan Hale was born in Coventry, Conn., June 6, 1755. Though a delicate child, he grew into a strong handsome boy whose smile made many friends. When less than sixteen years of age he entered Yale College and was graduated with honour in 1773, though only eighteen years old. For two years afterward, he was a successful teacher, but when the Revolution began he left his books, joined the army at Boston and was soon made a captain.

When Washington led the army to New York, young Hale went, of course, but we do not know much about what he did until after the American army was defeated at the battle of Long Island. Washington then retreated to the northern part of Manhattan Island. He did not know whether the British were preparing to attack him or to surround him, and called for a volunteer to enter the British camp.

Captain Hale offered to go, though his friends tried to prevent him. His answer was, "I wish to be useful; and every kind of service necessary for the public good becomes honourable by being necessary." He went to Norwalk, in Connecticut, on September 14, 1776, and crossed over to Long Island. Disguised as a travelling schoolmaster seeking employment, he visited the British camps in Brooklyn and New York and gained much information which would have been valuable to Washington.

HOW AN ACCIDENTAL MEETING LED TO CAPTURE

No one seemed to suspect him and in a few days he returned to the point on the Long Island shore where he had landed. He had given orders that a boat was to meet him there on the morning of September 20th in order to take him back to Norwalk. The night before he spent at a tavern near by, and there he was recognised by a man, who informed the British soldiers who he was. Some say that this man was his cousin, who was a Tory, but it cannot be proved.

Early the next morning he went out to meet the boat which was to take him back. A boat came, but it was a British boat, and took him to a British ship. There he was searched and notes and plans of the camps were found in his shoes. He did not deny who he was or what he had been doing, when taken before General Howe. Though the British general is said to have been much pleased with the behaviour of the young officer, the case was plain and he was sentenced to be hanged the next morning.

The officer in charge, named William Cunningham, is said to have been brutal and cruel. We are told that he refused to send for a clergyman, or to allow him a Bible, and that he tore up the letters Hale had written to his mother, his sisters and the young woman he was to marry. When all was ready, the young hero bravely faced death, saying, "I only regret that I have but one life to lose for my country."

THE BEAUTIFUL STATUE WHICH RECALLS HIS MEMORY

A beautiful statue of the young patriot by Frederick MacMonnies stands now in City Hall Park and some think is near the spot where he gave his life for his country. Others think he was executed nearer the East River and further north.

Now let us turn to the Englishman who also risked his life and lost it.

John André, the son of a Swiss merchant of London, was born in 1751 and was educated at Geneva, in Switzerland. On his father's death he carried on the business for a time, but after a disappointment in love, entered the British army in 1772, and in 1774 came to America. He was captured in 1775 and kept a prisoner for a year. When set free he was promoted to captain, and during 1778 was with General Howe in Philadelphia.

Under General Sir Henry Clinton, he was promoted to major, and during 1779 was with the British forces in New York, where he also won all hearts, by his conduct.

A TRAITOR TO THE AMERICAN CAUSE

Meanwhile General Benedict Arnold of the American army had been placed in command of the fort at West Point. General Arnold had been badly treated by Congress. He had enemies who prevented his promotion and attempted to ruin him. While in command at Philadelphia he had married the daughter of a wealthy Loyalist and had gone deeply into debt. Somehow, at some time, the idea of betraying his country came into his mind.

On September 20, 1780, by order of General Clinton, André went up the Hudson in the *Vulture* to meet Arnold. He went ashore, wearing his uniform, and the meeting was held in the woods. The arrangements were not ended when morning came, and they rode to the house of a farmer nearby.

It was arranged that Sir Henry Clinton should ascend the river and attack West Point. After pretending to resist, Arnold was to surrender the fort, and it was hoped also to capture Washington, who was then in Connecticut. For his treason Arnold was to be made a British major-general and receive $50,000 in gold.

THE CAPTURE OF ANDRÉ

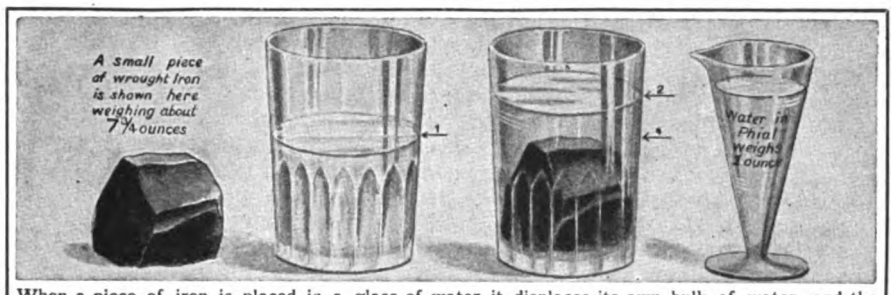
The farmer for some reason feared to row Major André back to the *Vulture* and he was forced to try to reach New York by land. Wearing an old coat given him by the farmer, he set out on horseback. He passed beyond the American lines into what was known as the "neutral ground" because both parties claimed it, though neither held it. On the morning of Friday, September 23, a party of seven young Americans stopped him. André, thinking they were Tories, told them he was a British officer. After this they would not let him go, though he had a passport signed by Arnold. They searched him and found papers in his stockings which showed him to be a spy, and took him to an American officer, who, not believing that Arnold was a traitor, sent André to him.

THE TRAITOR ESCAPES, BUT THE SPY IS HELD

Before he reached West Point, the officer became suspicious and had him brought back, but a soldier went on to inform Arnold of the capture of the man, who, it was thought, had forged his name. Arnold hastily escaped to the *Vulture*.

When Washington arrived a military court was assembled, and after hearing the evidence condemned the unfortunate young officer to death as a spy, though all regretted to make such a decision. Sir Henry Clinton tried in vain to save his life.

On the morning of October 2, 1780, the brave young man was hanged at Tappan, though he begged that he might be shot instead.



When a piece of iron is placed in a glass of water it displaces its own bulk of water, and the liquid rises from 1 to 2 as in the second glass. If the displaced water and the iron be weighed, it will be found that the iron is about 7¾ times as heavy as the water, and so its specific gravity is 7¾.

THE SIZE AND WEIGHT OF THINGS

CONTINUED FROM 3674

We read about the way in which things are measured—about the measurement of time, temperature, mass, and so forth, on page 3669. We can also learn to distinguish between weight and mass, and we may learn something about the balance of forces. We must now learn a little more about gravity, and then about another very interesting thing which is called specific gravity.

In the case of gravitation, we can allow things to drop, and measure their rate of falling, as we read on page 3672. It is very difficult, however, to get accurate results by this method. Far more precise results can be obtained by the use of a pendulum, for the rate at which a given pendulum swings depends upon gravity; and when we try this method we find that one and the same pendulum will swing at different rates in different parts of the world.

This can only mean that the force of gravity is not the same in different parts of the world. We know that the earth is flattened at the North Pole and the South Pole. This means that anything at the Equator is farther away—several miles farther away—from the centre of the earth than it would be if it were taken to either the North or the South Pole. As the force of gravity varies with distance, a thing must therefore be heavier at the Poles than at the Equator. But there is another reason why this should be so. The earth is spinning all the time. If we could stand upon either Pole of the earth, we should, of course, spin round once in twenty-four hours. If anything were placed six inches from the Pole it would, of course, describe a little circle round it in twenty-four hours. This movement would be very slow indeed. But very different is the case of that same thing if we take it to the Equator.

At the Equator the circumference of the earth is about 25,000 miles, and just as the thing near the Pole has to travel a few inches in twenty-four hours, so at the Equator it has to travel 25,000 miles in twenty-four hours—more than a thousand miles an hour. Now, we know that anything moving in this way on the surface of the earth—like the stone in the sling, as we see in the picture on page 3674—tends to fly out at a tangent to the circle in which it moves, and this is stupidly called "centrifugal force."

This, of course, applies to anything on a spinning body like the earth. The quicker the thing moves, the greater is its tendency to fly out; in other words, the so-called centrifugal force becomes greater and greater, the nearer anything approaches to the Equator, for the nearer it is to the Equator the more quickly

it is bound to move. This force acts against the earth's gravitation; indeed, it is the earth's gravitation that prevents things from flying out, and keeps them travelling in a circular path on the earth's surface, though the motion in them—like that of a stone in a sling—wants to make them fly out.

THE PULL OF THE EARTH, THAT GETS LESS AS WE APPROACH THE EQUATOR

Therefore, as the force acting against the earth's gravity increases as we approach the Equator, the force of gravity, when we weigh it, seems to be less the nearer we go to the Equator. It actually is less, because we are farther from the centre of the earth.

We know that gravity has the power of increasing by 32 feet in every second the rate at which anything falls to the earth. It is this rate by which we measure gravity, and now we can say more exactly what the figures are, and we can also learn the proper way in which to state them. We can take, for example, the first letter of the word gravitation, and we can let the letter g stand for the intensity of gravity in any part of the world. In England the value of g, we say, is about 32·2 feet per second; that is to say that for every second that anything falls in the British Isles its rate of falling is increased by about 32·2 feet each second; in other words, gravity produces, in England, during every second of its action, an acceleration—that is, a quickening—of 32·2 feet each second.

Now, the value of g at the Poles is about 32·25. We know that ·25 is a quarter, so that for every second during which a body falls at the Poles, gravity increases its speed by about 32 feet 3 inches; whereas in England the 3 inches would be nearer 2 inches. The value of g at the Equator is decidedly less than 32·1; so that the acceleration will be very little more than 32 feet 1 inch every second.

THE MEANING OF SPECIFIC GRAVITY, AND WHY IT IS IMPORTANT

We must now go on to study something else which depends upon gravity, and which is called *specific gravity*. The word specific, which is very much used in all the sciences, is really only another form of a word which we all know very well, and that is the word "special." We talk of the specific gravity of a thing, or of its specific heat, or the specific characters of a particular kind of animal or plant, and in all these cases the word practically means special.

When we talk of the specific gravity of anything, we are simply using a short expression for the amount of stuff in it in proportion to the space it occupies. A pound of lead takes up a great deal less room than a pound of wood; the lead has more stuff or matter in a given space. If we remember the word mass, we may say that the lead is more massive.

This question is very important, because of the great results which follow from the differences in the specific gravities of things. One thing floats and another sinks. When we run hot water into a bath of cold water, the hot water floats on the top of the cold; if we run cold water in after hot water, it runs as a stream at the bottom of the hot water; the warm breath from our lungs rises in the cooler air into which it is breathed; a balloon filled with hot air or hydrogen will float, or rise, and so on. All of these facts, and thousands more, depend upon the important question of specific gravity.

WHY WE USE WATER AS A STANDARD FOR MEASURING WEIGHTS OF THINGS

We are now faced again with the question of measurement. We want to be able, in some short and simple way, to say how heavy gold is compared with water, or how heavy water is compared with alcohol, and so on. That is the way we put it in ordinary speech. We say that one thing is heavier than another; we do not mean that a pound of gold is heavier than a pound of water, but that we can get a greater weight of gold than we can of water into a given space. Gold has a greater specific gravity. Water is such a common substance, and so important, that we may take it as our standard.

Ordinary water contains various things dissolved in it, especially gases, and these make a difference. So when we speak of water in this connection, we mean distilled water, but this is not all. We know that, as a rule, when things are heated they expand, and when they are cooled they shrink. The amount of stuff in a given space changes; in other words, the specific gravity changes. So it will not do to say distilled water. We must know at what temperature we

are considering it. When we study water, we find that it is densest, most shrunken, or heaviest, when it is 4 degrees centigrade above its freezing-point.

On the sensible centigrade scale, the freezing-point of water is nothing, so that 4 degrees centigrade indicates the temperature at which water is densest. Now, we can take this as our standard. The specific gravity of pure distilled water is 4 degrees centigrade, which we shall, for convenience, call 1; then, if we find anything that has twice this specific gravity, we shall call that 2, and so on.

We must choose all sorts of different things, and compare the weight of a given volume of each with the weight of an equal volume of water at 4 degrees centigrade. Here we are measuring weight, of course, and we are using it as an indication of the mass in the things we are examining. We are perfectly entitled to do this, because Newton has taught us that the weight of everything depends upon gravity, and that the force of gravity depends precisely upon mass. So if we compare the weight of things, we are really comparing their masses.

How we may find out the space occupied by anything solid

Now, suppose that we want to find out what is the specific gravity of some odd-shaped thing. We can weigh it all right, but we want to know more than what it weighs; we cannot tell its specific gravity until we know how much space it occupies, and if it is an odd-shaped thing, this may not be at all easy to find out. If it is a thing shaped like children's blocks, there is no difficulty. With a thing of irregular shape, we can easily find out how much space it occupies by putting it into water, and noticing how much the water rises.

It is often very important to study the specific gravity of liquids. For instance, milk ought to contain in itself a certain amount of solid matter melted in it. It is for this solid matter that we buy the milk, as it gives it its food value. If water is added to the milk, we are being cheated. And surely we are being cheated no less if the cow is made to drink large quantities of water, which really comes to the same thing. There must be some way in which we can tell whether the amount of solid matter dissolved in the milk comes up to the standard, and we can do this by measuring the specific gravity of the milk. In the case of spirits, we want to know how much alcohol they contain, and we can do this by ascertaining their specific gravity. These are two common instances, but, of course, very many others could be mentioned.

A little instrument that tells the specific gravity of any liquid

There is a simple little instrument called the *hydrometer*, which means water measurer, by which anyone can find out in a moment the specific gravity of a liquid. It is simply a glass tube with a weight at the lower end, and with a scale marked on it, like that on a thermometer.

The heavier the fluid in which we place the hydrometer, the less is the depth to which it will sink before it floats. On the tube is a mark which shows the level at which the hydrometer will float in water. If the liquid is lighter than water, as, for instance, alcohol, the hydrometer will sink deeper than this mark; if it is heavier than water, like milk, the hydrometer will not sink so far. We shall see in a little while what are some of the results that are obtained with this simple little instrument.

Another kind of instrument for measuring specific gravity is called a specific gravity bottle, and it is very simple and easy to understand. It can be used sometimes for measuring the specific gravity of liquids, and sometimes for solids. The bottle has to be very carefully made, so that it will hold exactly a thousand grains of water at the temperature we have agreed upon. The stopper of the bottle has a hole through which the contents can escape when the stopper is driven home.

A bottle of water, and what it can teach us

Supposing we want to measure the specific gravity of some small shot, we can take a given weight of the shot and put it into such a bottle already filled with water. The volume of water that escapes from the bottle in order to make room for the shot is exactly the same as the volume of the shot inserted. All we have to do is to weigh the water that escapes and compare it with the weight of the shot. Suppose the shot weighs eleven times as much

as the water of the same volume, then the specific gravity of the shot would be eleven. This would be just about the figure if the shot were made of lead.

Or, again, we could fill such a bottle as this with ether, and then weigh the amount of ether that we could get into it. We should find the bottle that held a thousand grains of water would only hold about 715 grains of ether, so that the specific gravity of ether is ·715, if we call the specific gravity of water 1. It is often very convenient to use 1,000 for the specific gravity of water instead of 1, and then we can say that the specific gravity of ether is 715, that the specific gravity of milk is about 1,030—it should not be less—and that the specific gravity of healthy blood is 1,055, and so on.

DIFFERENT THINGS COMPARED AS TO THEIR BULK AND WEIGHT

Here is a table which shows us the specific gravities of some important substances as compared with the specific gravity of water, counted as 1. We shall readily understand that those things which possess a specific gravity higher than 1 will sink in water; while those, such as ice, for instance, which have a specific gravity less than 1 will float upon water; but the nearer the specific gravity is to that of water, the greater is the amount of the thing which must be immersed in water before it can float. Here is the list:

SOLIDS

Platinum (rolled)	22·1	Diamonds	3·5
Gold	19·3	Marble	2·8
Lead	11·4	Aluminium	2·7
Silver	10·5	Ice	0·9
Iron (wrought)	7·8	Potassium	0·9
„ (cast)	7·2	Lithium	0·6
Tin	7·3	Cork	0·2

LIQUIDS

Mercury	13·59	Sea-water	1·03
Sulphuric acid	1·84	Petroleum	0·84
Blood	1·05	Alcohol	0·79
Milk	1·03	Ether	0·71

Gases, of course, have their own specific gravity, just as solids and liquids have. In this case we usually take the gas hydrogen, which is the lightest of all, and we state the specific gravity of other gases by comparison with it. Sometimes air of a certain temperature is taken, but it is better to take hydrogen. If, now, we call the specific gravity of hydrogen 1, then that of oxygen is 16, and that of the mixture of gases we call the air is about 14·4; in other words, hydrogen is only about one-fourteenth part as heavy as air, though, of course, if we want to make this statement a precise one, it is necessary to state the exact composition of the air we are comparing it with.

WHY A BALLOON GOES UP, BUT WILL NOT GO UP FOR EVER

We can now understand why a balloon filled with hydrogen will rise in the air; we can also understand that there will be a point beyond which it cannot rise, because the air becomes less dense as we pass upwards in it. In other words, the specific gravity of the air is lowered, and there comes a point when it can no longer do more than just sustain the balloon, even though it is filled with hydrogen.

This is all we need say here about the specific gravity of gases, but we must note a few of the facts which are suggested in the table of solids and liquids. We notice the great weight of various metals, and also that one of them, though liquid, ranks high in specific gravity, even when compared with solids. This liquid metal is mercury. There is no other liquid which at all approaches it in specific gravity.

All the metals are by no means very heavy. Potassium and lithium, for instance—metals we seldom see in their pure state outside a laboratory—have a specific gravity of less than 1, which means that they will float upon water. Just above them in the table, we notice ice, and remind ourselves that water, when it is cooled to freezing-point from 4 degrees centigrade, expands, and therefore its specific gravity becomes less.

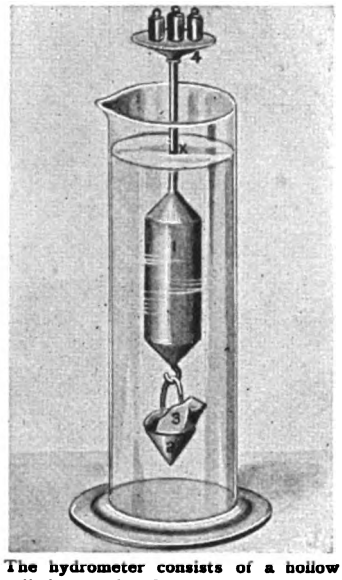
THE GREAT VALUE OF ALUMINIUM, THAT IS BOTH STRONG AND LIGHT

Perhaps, after the case of ice, the most important of the specific gravities noticed here is aluminium. This is also a metal, but very much lighter than any of the metals in ordinary use. We have only to compare it with iron, and to remember that aluminium is a strong thing, to see that its extreme lightness must be of great practical importance.

There are some interesting points in the list of liquids. We have already referred to the case of mercury, and we note the astonishing difference between this liquid metal—the only metal liquid at ordinary temperatures—and all

the other liquids. Several of the specific gravities noticed in this list are of great importance in testing the purity and the composition of various things. In the official book that gives instructions to chemists, for instance, they are told that such things as ether or sulphuric acid, employed by them, must have such and such a specific gravity. The simple method of using a hydrometer provides us with an easier and quicker test of purity than any other.

When we compare milk with blood, we notice that milk, which is made by the body from blood, is slightly more watery. It is one of the most important duties of the body to keep the specific gravity of the blood at a constant level. None of the processes with which the blood is concerned can proceed properly unless its specific gravity is constant. If a person goes without water, fluid has to be drawn into his blood-vessels from the tissues around them, in order that the blood shall not become too dense. If, on the other hand, a person takes a great deal of water, this is not allowed to make his blood more watery than it ought to be, and all the resources of his body are immediately brought into action—not in a few hours, but in a minute or two—to get rid of the excess of water as quickly as possible. For this purpose, the lungs, the kidneys, and the skin are all available.



The hydrometer consists of a hollow cylinder (1) that floats in water, and is balanced upright by a heavy pan (2) in which is placed any object (3) whose specific gravity is to be measured. The object is first weighed out of water and then in water, as shown here, by putting weights on the platform (4) to make the upright stem sink to a standard mark (x). From these weights the specific gravity can be calculated.

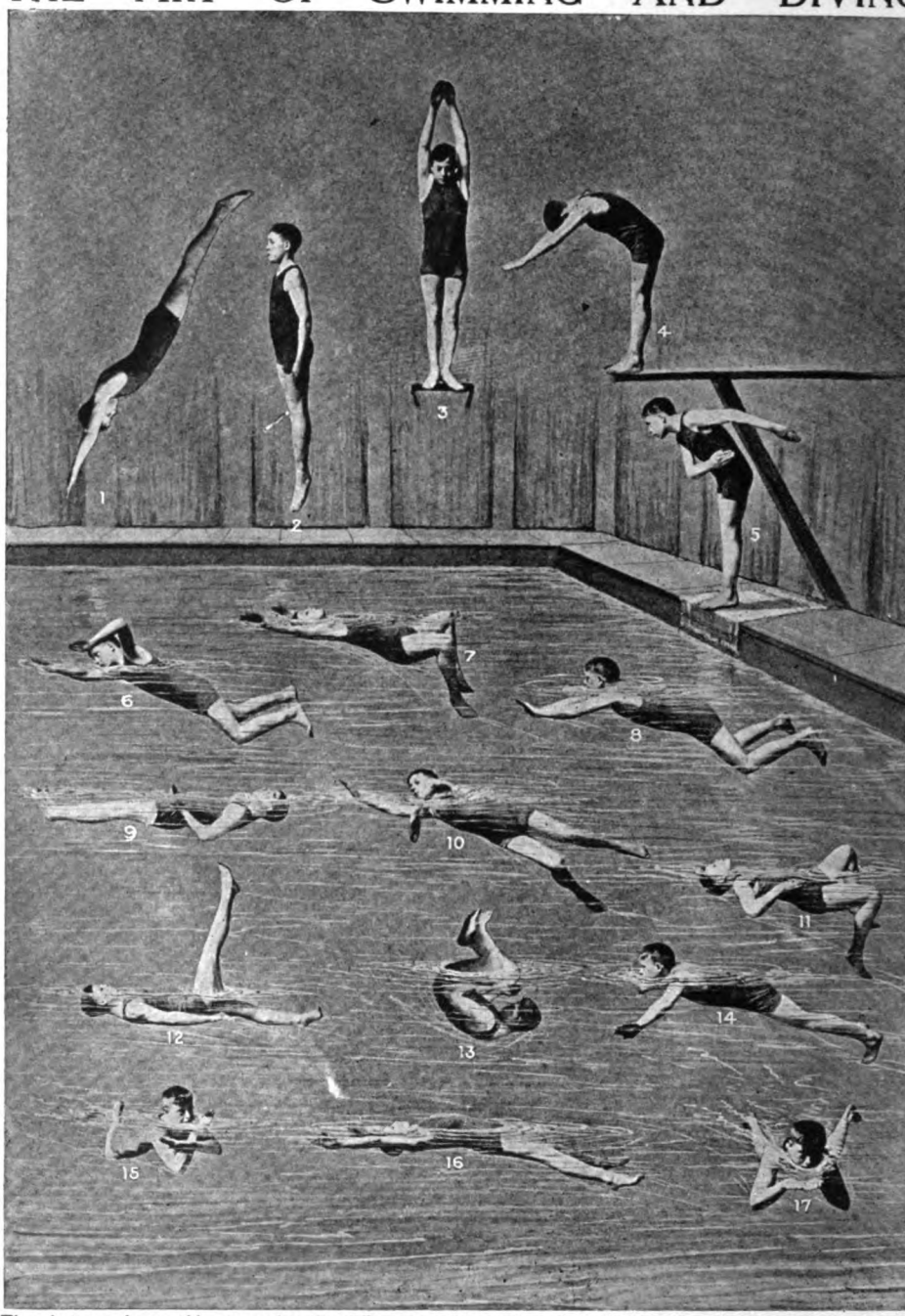
If the individual to whom the excess of water is given is producing milk, then, in such a case, the glands that are producing the milk are pressed into the service of the body for the purpose of getting rid of the excess of water. In France there was recently a very interesting prosecution of a cow-keeper who made his cows drink enormous quantities of water, thereby greatly increasing their output of milk, but, of course, greatly lowering its specific gravity and its food-value. It is for detecting such things that the hydrometer and the principle of specific gravity are so useful.

Of course, a very interesting question arises, whether we can accuse the man of watering his milk who puts the water into the cow instead of pouring it into the milk-pail. It is the business of the law to say that you shall not sell as milk anything which has less than a certain specific gravity. This has its difficulties, too. The specific gravity must not be made too high, for we must allow for the natural variations which neither the cow nor its owner can help; then, if we keep the specific gravity down, the dairyman will probably take good care to sell no milk of any higher specific gravity. When the cow produces a rich milk, he will water it down till it is still just within the requirements of the law. This shows that the making of perfect laws is a very difficult thing. Lastly, we must refer to the specific gravity of sea-water, which is just about the same as that of milk, but slightly less than that of the blood of the higher animals. This is interesting for two reasons. The history of living creatures teaches us that all life began in the sea. The correspondence between the fluids of our bodies and sea-water to-day is very interesting. It applies not only to their specific gravity, but also to the nature and proportion of the salts they both contain.

The other point about the specific gravity of sea-water is the manner in which it affects the art of swimming. Swimming and flying are both practical problems dependent upon specific gravity. The higher the specific gravity of the atmosphere, the easier it is to fly; the higher the specific gravity of water, the easier it is to swim.

The next part of this is on page 3835.

THE ART OF SWIMMING AND DIVING



The photographs on this page give the different positions adopted in diving and swimming, and also some of the fancy tricks which we can all learn as soon as we can swim easily. How graceful it is possible to look in diving from a height is shown in 1, where the body is in almost a straight line. Diving feet first from a height is shown in 2. Here the diver will go deeper than in diving head first. A Swedish dive is being taken in 3, and a high dive in 4, while the way to dive in at the start of a race is shown in 5. No time must be lost in coming to the surface in this dive. Three of the positions the swimmer assumes in the breast-stroke are shown in sequence in 17, 8, and 14. Swimming on the back is shown in 7, the trudgen, or Indian, stroke in 6, the side-stroke in 10, and paddling on the back to rest the arms in 11. Of the many fancy feats, we see, in 9, the torpedo float; in 16, the dead man's float; in 12, the nautilus; in 13, turning a somersault; and in 15, swimming like a crab.

HOW TO SWIM AND DIVE

CONTINUED FROM 3726

SWIMMING is one of the healthiest and most enjoyable of sports. The ability to swim may enable any boy or girl to perform that greatest of all deeds—the saving of a human life. We can learn to swim almost as soon as we can walk ; the babies of the South Sea Islands, indeed, are able to swim before they are strong enough to walk, and, out there, any native child who is not at home in the sea would be a curiosity.

It is quite possible for us to teach ourselves to swim, especially if we are confident, but we shall learn much more quickly if we have a friend or parent who can give us a helping hand. Water is quite able to support our weight, and we can easily prove how buoyant it is by standing with the water up to our waist and then trying to touch our toes. It is almost impossible to do this, because of the lifting power exerted by the water.

For our first attempt let us walk out into the sea or bath until the water reaches just above our waist. Turning towards the shore, we should ask a companion to put one hand under our chin and the other hand under our body. Thus supported, we must hold our head well back, close our mouth, and breathe only through our nostrils. It is, perhaps, best at first to work the arms only, so that we can fix our attention on them alone, letting our legs remain stretched out stiffly. Keeping our fingers and thumbs close together, and placing both hands just under the chin, we push our hands out as far as we can, thumbs touching, palms downwards, and the backs of the hands very slightly curved, just under the surface of the water. We then turn the palms outwards, and bring the arms round in a wide and strong sweep until they are in a straight line with the body. Next we bend the elbows, bring them to our sides, and place our hands in front of our chest ready for the next stroke. This movement is easily mastered, and we can now turn our attention to the leg-stroke. In order to do this accurately, we first gently draw both legs towards the trunk, the backs of the heels touching, and the knees and toes pointing outwards ; the soles of the feet should be just covered by the water. We then kick both feet out strongly at an angle to the body, so that at the finish of the kick our legs are quite wide apart, and, without pausing, we bring both legs smartly together, being careful not to bend the knees. It is mainly this last movement that drives us along, and our companion will soon find it necessary to walk along beside us. We must not hurry in striking out with our hands and drawing up our legs, as these are negative movements. The legs should be drawn up as the arms are swept round, and kicked out as the arms are pushed forward. The breath should be taken in when the arms are wide apart. In kicking out, the best swimmers give the legs a kind of twist or screw as if working a paddle.

Should no friend be with us, we shall find that when we lean forward and push our arms out, our legs will rise towards the surface of the water.

We must next learn to swim on our backs. This is most important, as it is the one way by which drowning or unconscious persons are brought to land. It is, too, the least tiring method, and in long swims in deep water, if we turn and swim on our backs, it will enable us to rest our muscles and lungs. The stroke is very similar to the breast-stroke, only we lie on our back. A companion may assist us by placing his hand under the hollow of the back, but if we can swim easily on the breast we shall not need help. Stretching out our arms to right and left, we must lean back on the water and lift our feet off the ground. Our legs will

come readily to the surface if we keep our head well back with our ears under the water, and, if we lie quietly, we shall find that we do not sink. To move along, however, we bring our hands to our sides. Both arms are then brought out of the water in a circular sweep, and placed in the water as far behind our head as we can reach. The thumbs should touch in performing this movement, and the hands should turn so that as they enter the water the backs of them meet. The palms are then ready to present as large a propelling surface to the water as possible when the arms are brought in a wide and powerful circular sweep just under the surface, until they lie straight along each side of the body. The legs are brought up and kicked out just as for the breast-stroke. Should the arms be tired, they can be folded on the breast and the legs alone worked, the breath being taken during the finish of the kick-out.

THE SIDE-STROKE AND THE OVER-ARM STROKE

We now come to the side-stroke and the speedier overarm stroke. Turning on our right side, we push out our right arm in a straight line with the body, the fingers and thumb being closed and at right angles to the surface. The palm is then turned outwards and the arm is pulled down strongly, without the elbow being bent, until it points to the bottom. The arm is then drawn in to the body by bending the elbow and turning the wrist inwards, and moved along in front of the chest until it is in a position to push out again from just under the ear. The left, or upper, arm moves alternately in the same way, but the hand cannot go so deep, and the elbow must be bent slightly, otherwise the body would roll forward. The only difference in the movement of the arms in overarm swimming is that the left arm is brought right out of the water and dipped slightly farther in front of the head than the hand reaches when it is not taken out of the water. The breath should be taken when the head rises well out towards the finish of this stroke, and it can be expelled quite easily when the head is under the water while the arm is swung over.

There are at present two forms of leg-stroke used in swimming on the side. In the older method both legs were drawn up under the body and kicked out widely, as in the breast-stroke. In the newer method, now adopted by all the best swimmers, the knee of the upper leg is bent but little, that is to say that the left foot is never drawn up, but kicked slightly forwards. The heel of the under leg is brought back towards the body. Both legs are then brought sharply across each other as in walking, the left leg being straight as it passes the straightened right leg, and not being bent back until it has again crossed the right leg. We can, of course, swim on our left side if it is easier to do so, and it is as well to practise swimming on both sides.

The trudgen-stroke of the American Indians remains to be learned by any strong boy or girl who desires to move fast through the water. It is at first very tiring, and cannot be kept up for long by any but the very best swimmers. Each arm in turn performs a circle through air and water, the palms being turned away from the body as much as possible. The leg-stroke resembles that used in the side-stroke, but it is shorter and quicker.

Some swimmers give a kick for each stroke of the arm, but this is very tiring; and it is perhaps best to kick every time we make a stroke with our stronger arm, taking in breath when our head is well above the water.

HOW TO DIVE GRACEFULLY

Diving is a valuable and graceful accomplishment for the swimmer. If we see a person drowning, we can always go over the boat or pier feet first, but by arriving in the water head first and arms out we can more easily and quickly take our first stroke. We must learn to keep our feet together, and legs, body, head, and arms in one straight line, as we enter the water. Thumbs should be locked and the backs of the hands uppermost. We come to the surface of the water by raising our arms upwards. In standing on a diving-board, our toes should project over the edge, and the spring taken from the balls of the feet. In diving at the start of a race, we must dive as far out as we can without falling flat, and rise to the surface without a moment's delay, drawing up our legs for our first kick as we do so. We should never dive into water of unknown depth, and our eyes should be opened under the water.

The most important diving, however, is the least showy, and it is the art of going to the bottom from the swimming position. By lowering the chin on to the chest, rounding the back and swimming downwards with the arms, the legs are brought up and out of the water, and their weight then drives the body down, and by swimming with the head kept well forward the bottom can be reached.

TRICKS IN THE WATER

There are many tricks that can be learned, such as swimming like a dog or crab, swimming with arms and legs tied, swimming like a porpoise, the nautilus, and somersaults on the surface of the water, and some of these strokes are shown in the picture on page 3818.

It is sometimes necessary to remain stationary by treading water. We literally tread water as though walking upstairs, or perform the leg-stroke used in swimming on the breast while the body remains in an upright position.

There are certain things that we must not do in bathing. We should on no account enter water beyond our own depth until we can swim at least fifty yards without a rest. In learning we should never use cork belts, bladders, or water-wings, as these prevent the body from taking its natural position in the water. They have been known to slip, and thus cause the wrong part of the body to float and the head to sink. We must not hurry our strokes in learning. It is quite surprising how slowly we can take our strokes and make good progress. We should never bathe within half an hour after a meal, or at any time when very hot, very cold, or very tired.

MAKING MAPS IN SAND

SAND-MODELLING has always been a feature of the annual seaside holiday. Every boy and girl, whether young or old, feels a keen delight in building a fort or castle, and then watching the incoming tide creep closer and closer, until the first tiny wave washes the outer wall, and the whole building is at length swallowed up by the sea. There is no reason why sand-modelling should be enjoyed only at the seaside. Some of our public parks have sand-piles expressly built for children; and sand is so clean that, with care, it can be used even on a table indoors. We can spend a very enjoyable time by modelling in sand at home, either in the garden or in the house; and the models that we can make will teach us how to build larger ones on the beach during the holidays.

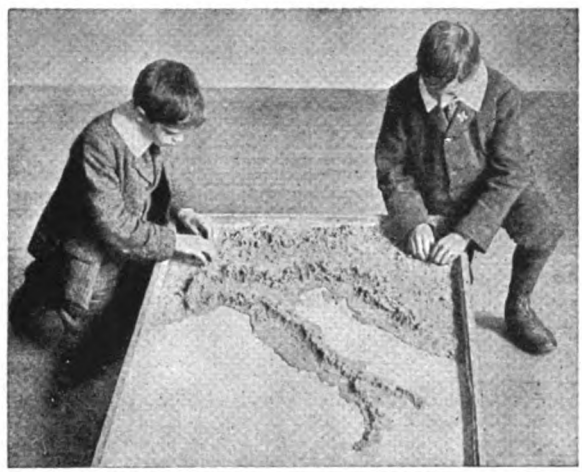
We have all seen maps of countries which are called relief maps; these look as if a photograph of the country has been made in such a way as to show very plainly the mountains and valleys. Such a map, made out of sand by two boys, is shown on this page. Usually these maps are made of clay or plaster, and much skill is required in their construction. Those of us who have tried to make such maps know how stiff and unnatural our attempts have looked. But we need not use clay or plaster. Sand, we shall find, is well suited for this work; and the new way in which we shall use it will give everyone a map that really looks like a model of a country.

The map cut out and the small slips of paper placed in position all round ready for the modelling in sand.

First of all we will try a little experiment, so that we may understand thoroughly this new method of modelling. With a pair of scissors let us cut out any irregular shape having edges that, like a coast-line, are more or less indented. We now place this irregular shape flat upon the ground, or on a board or a table. Underneath the edges of the shape slip a number of small sheets of paper in such a way that they project, or stick out, and cover the whole of the board or the table for some little distance round our cut-out shape. Now sprinkle some dry sand over the shape until it is completely covered. Carefully remove the loose sheets of paper one at a time without dropping any of it off them, and what shall we find? Before us is a perfect model in sand of the shape which we cut out.

Having grasped the idea, let us get to work to make a real map. We shall want some fine sand, and, in most cases, this can easily be procured by sifting. But should there be any difficulty in obtaining it for nothing, the best silver-sand can be bought at a painter's, and a few cents' worth will make a large map. We must now divide the sand into two fairly equal parts. The one part must be kept thoroughly dry, and any lumps must be broken between the fingers so that the whole is a fine powder. This dry sand may be kept in a can, and as we shall use this can as a sprinkler, some tiny holes must be made in the lid. The other portion of the sand is to be used in a wet state, and must be kept in a glass or earthenware jar. Wet sand kept in cans very quickly becomes unpleasant owing to the iron of the misnamed tin beginning to rust.

Our sand is now quite ready; and we can begin to cut out a map which will this time be our irregular shape. Although rather a difficult map to cut out, we should all rather like to start with our own country. Perhaps we can find a large map of the United States in the front of a steamship line advertisement or it may be that some advertising firm has been distributing maps. In either of these cases we can start right away to cut round the coast-line, but otherwise we must first draw or trace the outline form of a map.



MODELLING A RELIEF MAP OF ITALY IN SAND

We must remember that this cut-out map will, with care, last for many models, so that it will really pay us to make a good one. Having cut out the shape of the country, we will protect it from injury by fastening it to a larger sheet of paper or cardboard. The little projections will now be less likely to get torn, and the map itself will not be able to slip while we are modelling. This protecting sheet may be fastened to the map by paste or gum or by one or two stitches of thread or silk, but such fastenings must be at a spot as remote

from the coast-line as possible, so as not to interfere with the pieces of paper which we must slip underneath the map. One brushful of paste in the centre of the map will be found ample for this purpose. If this protecting sheet is one of blue or green paper, a better effect will be given to the finished model; but this is by no means necessary.

rules should be carefully observed: In the first place these sheets should not overlap one another; in the second place a separate sheet must be employed for different coasts. That is to say, the same piece of paper must not be used for the east coast and also for part of the south coast. A glance at the diagram will show how these sheets are to be

A relief map of Great Britain and Ireland modelled in silver-sand. Any boy or girl can make a sand map like this, showing the mountains rising above the general level of the land, by following the directions in these pages.
This photograph is from a relief map by Mr. W. F. Fowler, the inventor of the new method of making maps in sand.

Another way is to fasten our cut-out map to a drawing-board by a few drawing-pins, as seen in the diagram on the previous page.

Before beginning a model in sand, slip the loose sheets of paper between the map and the protecting sheet. The success of the model will largely depend upon the way in which these sheets are placed, so the following

placed. Take above diagram, for instance,—Ireland has been omitted. The space between this island and Great Britain is so small that we shall do better if we model Ireland separately and slip it into place when finished.

Now take some of the wet sand, and model the mountains by pinching it up into little pinnacles with the fingers. The dampness

will enable these mountains to be moulded into characteristic shapes. If a good relief map is available for a copy, even well-known peaks may be indicated, and some idea of the highest points in the several ranges of hills can be given.

Having finished the mountains and hills, sprinkle the whole lightly with dry sand, taking care to keep all sand within the limits of the loose sheets of paper. Draw these away singly, moving them away from the coast-line whenever possible in a direction at a right angle to the coast-line. A slight to-and-fro movement will help the superfluous sand on the map to drop clear of the coast-line, and will give the map a clearer appearance. There remains a perfect outline of the country, such as cannot be easily obtained by other means, and we have an excellent model, or relief map, of our country. The photograph on page 3821 shows what the map will look like.

River-courses may now be traced in the sand by means of a match-stick, or represented by lengths of blue cord laid into position upon the map. Ports and other towns may be shown by coloured beads or marbles, while the railway-lines connecting town with town may be indicated by matches placed end to end. The various railway systems may be distinguished by painting these matches different colours. Should we wish this sand map to keep its shape for some considerable time, we must lightly sprinkle its surface with water. The shape once cut out, the map can be so quickly modelled that such a precaution will hardly be necessary.

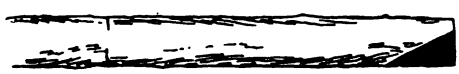
This shape should, if possible, be kept flat; but if this is impossible, it can be made smooth enough for modelling by slightly damping or by ironing it over.

In the same way animals, flowers, portraits, and other modelling exercises which require a correct outline, may be reproduced in sand. All we have to do is to cut out the outline and lay loose sheets of paper under it, as in the case of the map. The modelling of the raised parts may now be carried out in clay or plasticine, and the dry sand sprinkled over the whole, as before.

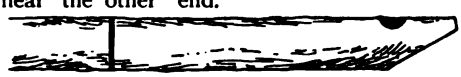
To keep the sand from littering the table or reaching the floor, we can make a modelling-tray out of the lid of a large cardboard box. The sand, especially that which has been moistened, should be spread out occasionally in the sun to dry, for by this means it is possible to keep it perfectly fresh and clean.

A WHISTLE THAT A BOY CAN MAKE

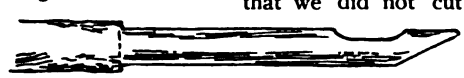
When we are in the woods in springtime or early summer, we can make a good whistle easily and quickly. All we need is a knife and a thin piece of green sycamore or willow that we can cut from a bush or tree. The method of manufacture is simple. First we cut off the wood, selecting a piece with nice, smooth bark, and as nearly round as possible. It should be four or five inches long. Cut it straight across one end, and then at the same end cut a slanting piece off, as seen it picture 1. That makes the lip of the whistle. Now we make a notch at the top side of the lip, as seen in picture 2. We then cut a ring round the bark only, down near the other end.



1. First stage

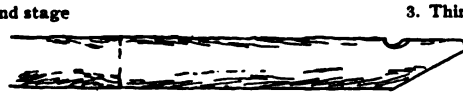


2. Second stage



3. Third stage

Now we take it and moisten the bark all round, either in a stream or pool, or in the mouth. Using the knife like a tiny hammer, we beat the bark all round and up and down with the handle of the knife, moistening the bark several times as we do so. We should beat it gently with the knife, and not hard enough to injure the bark. When we have done this we shall find that the bark can be slipped off in one piece right from the ring that we made to the point of the stick where the lip is. The surface of the stick, when we have removed the bark in this way, will be smooth, with a transparent and somewhat sticky fluid adhering to it. That fluid is the sap of the tree; and if it were not for this sap flowing up the tree under the bark as the tree grows, it would die. We wipe off the sap, and then, with the knife, we enlarge the notch that we have made by cutting away a piece of the wood lower down, as seen in picture 3, which shows the piece we should cut away. Now we cut a very thin strip from off the top of the stick between the notch and the pointed end, or lip. Our whistle is now made. All we have to do is to replace the bark that we took off in one piece, as we see in picture 4. The whistle should now work perfectly, giving a clear, shrill note when we blow into it. If it does not quite work well, we may discover that the notch was not enlarged sufficiently, or that we did not cut away enough of the top of the mouth-piece. Let us remedy these defects if they exist, and see if the result is better. If we are entirely successful, we may become more ambitious, and try to make a whistle giving several notes on the scale, thereby making a musical instrument that can play simple tunes. For this larger instrument we need a little longer twig, say about nine inches long, and before loosening the bark we must cut several round holes that extend farther down the stick. Then, when we have removed the bark, we must extend the notch right down past all the finger-holes. We must handle the larger instrument when it is made very gently indeed, for it is easily broken.



4. The completed whistle

A FLEET OF LITTLE BOATS

BIG boats and small boats, heavy boats and little fairy boats we can make from fruits, nuts, and treasures of the garden and wood. Nimble fingers will soon build our little fleet; and in a big tub or bath, filled with water, we can set the boats afloat.

First we will make a gondola out of a banana-skin, choosing a perfect fruit, well turned up and flat between the ends. We cut down along the middle of the flat part, and through the opening cut the pulp into sections, which can be drawn out on the point of a penknife, leaving the skin perfect. Then we curve a piece of thin card, insert it towards the pointed end, and put a match for a seat towards the stalk end. We may have to put a copper coin in the bottom of the boat to steady it in the water. The result is seen in picture 5.

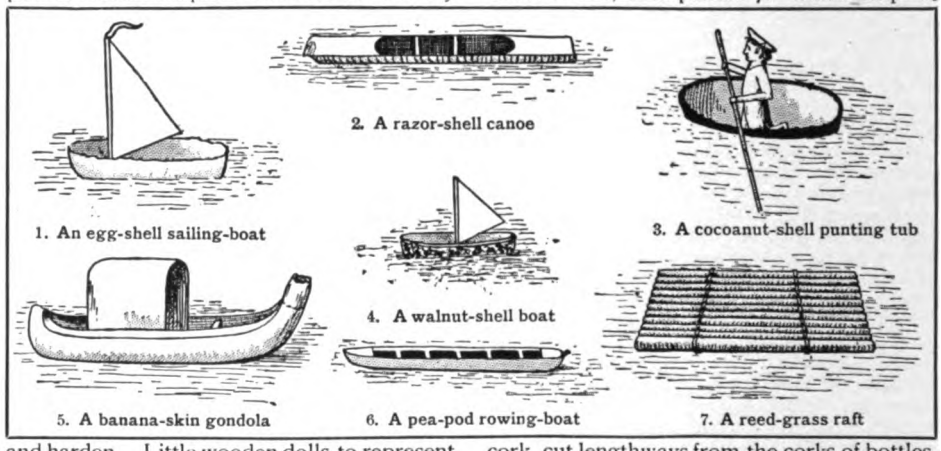
We can make another boat out of half a lemon or a small orange cut lengthways. We remove the pulp, and trim the edges with scissors, insert strips of card for seats, and put the coracle-shaped boat in the oven to dry and harden. Little wooden dolls to represent ancient sailors, with pieces of wood for oars, can be seated in the coracle.

For a rowing-boat we can use the half of a very large pea-pod with the stalk cut away. Small strips of card will do for the seats, as we see in picture 6, and, if we are skilled in cutting out, we can shape little card rowers with two oars each, made of card or grass-blades.

We know, of course, that cocoanuts float. So out of the sawn half of one we can make a round punting tub, and in it place a small wooden doll, with a stick for a punting pole, as in picture 3.

All these things make fairly large boats; but there are many things from which we can make dainty little ones. There is, for instance, the half of a walnut-shell. We divide the walnut carefully with a knife, taking pains not to crack the shell, remove the nut, and scrape the inside of the shell clean. As this is suitable for a sailing-boat, we get a piece of stiff white paper, gum one side round a piece of match-stick, and with a little sealing wax secure the mast to the bottom of the boat. Picture 4 shows us what it is like. The walnut is easy to halve, but not so an egg-shell; yet this makes a pretty white boat if we can manage to secure a sound half. Perhaps the best way is first to crack an egg in the middle and from that hole remove the shell in small pieces before carefully taking out the contents. It is better to leave an irregular edge to the shell, as in picture 1, than to risk cracking our boat.

As to the sail for this boat, it can be made of thin white paper fastened to a mast of very stiff paper folded in halves, with one end bent at right angles, so that the bent part can be stuck down to the inside of the boat with sealing wax, while the edge of the sail is gummed into the folded paper that forms the mast. Being fragile, the egg-shell boat may easily be injured in a collision. As shipwrecks do sometimes occur, it is just as well to have a lifeboat or a raft on our miniature sea. A raft might be made of match-sticks, or pieces of reed-grass roped together with coarse white cotton, as in picture 7. Small strips of cork, cut lengthways from the corks of bottles, will answer the purpose of a raft, and refuse to sink. Failing any other material, the raft can be shaped from a large flat leaf, such as the plane or ivy.



1. An egg-shell sailing-boat
2. A razor-shell canoe
3. A cocoanut-shell punting tub
4. A walnut-shell boat
5. A banana-skin gondola
6. A pea-pod rowing-boat
7. A reed-grass raft

During the acorn season we probably gathered some acorns with their cups; if so, we have nice little punting tubs ready to be floated at once. An acorn in a cup can serve **the purpose of a buoy, if we secure a thread to the stalk and a weight to the other end of the thread, which must, of course, be long enough to reach the bottom of our sea. The acorn can be cut in halves lengthways, the nut removed, and the shell used for a small boat, the flat end forming the stern, and the pointed end the bow.**

The petals of flowers float easily on water, so that from them alone we can get dainty small boats of many colours. Red, pink, yellow and white roses will give us variety. As a rose petal is very fragile, a sail, supposing we wish for one, would have to be made of tissue paper, say pink for a pink boat. To form the mast we can roll the paper down one

side. A drop of gum or paste will be all that is necessary to keep it in its proper position.

In autumn the halved outer coats of horse-chestnuts and walnuts make strong little boats. Then, if we get a large piece of cork or a small block of wood, we can shape it into a modern warship, and even use monkey-nuts, acorns, or filberts for torpedoes. A fireship is made from a lump of camphor set alight.

Some shells make admirable boats, and float well. The long-shaped razor-shell answers for a canoe, as in picture 2. Paper can be pasted over the two ends, and an uncovered space left in the middle. As such a boat is comparatively large, it can be launched near the gondola shaped from a banana. Mussel-shells also make good boats; and small, black, closed ones will suggest to us not only dangerous torpedoes, but porpoises floating on the surface of the water.

For all these things we must use our imagination and inventiveness; and we shall be surprised to find how interesting boat-making can be when we go to Nature's wonderful storehouse for materials wherewith to build them.

HOW TO KEEP FRUIT FRESH

UNFORTUNATELY for boys and girls, and for grown-ups too, fruit becomes ripe only in the autumn, so that at one season of the year we may have more fruit than we can eat with comfort to ourselves, and at other times, when we would like to have certain fruits, we cannot have them, either because the season of that fruit has passed or has not yet come. But we are far more fortunate than our grandparents were, and even than our parents were when they were as old as we are now.

We get large supplies of fruit from California in the west, and Florida in the south, to say nothing of the great quantity of tropical and sub-tropical fruit shipped from the West Indies.

Thanks to the quickness with which railway trains and modern steamships can carry fruit, and to the modern methods of keeping fruit while it is being carried on the ocean, we have two seasons a year for many kinds of fruit. But, in spite of that, it is as well to know how to keep fruit longer than we can do by letting it lie about without any special measures being taken to prolong its life. So we shall learn how to do it in this article.

First, we must know what causes fruit to go bad. The decomposition of fruit, as we call it, is caused by the attacks of microbes, which are the very tiny little living things that we read something about on page 781. Once the microbes have begun to settle on fruit, it gets bad ever so much more quickly. Thus the effort to keep fruit fresh is really a fight between the microbes and ourselves. It seems ridiculous to talk about a fight between men and creatures so tiny that we can see them only with the help of a strong microscope. But, in spite of that, if we are not very careful the microbes will win the battle, and our fruit will go bad very soon. The microbes are bound to win eventually; we cannot help that. The most we can do is to beat them off for a time, to keep the fruit a few weeks or months longer than otherwise. We cannot make its freshness indefinite. If we know what conditions favour the growth of microbes, then we know that by avoiding or preventing these conditions we can make fruit remain fresh a little longer. Microbes thrive and multiply in damp and stagnant air; therefore our fruit should be kept in a place that is cool and shady, yet airy and dry. Fruit that is intended to be kept should be gathered when not fully ripe. Care should be taken not to break the skin, and any bruised fruit should be put aside to be eaten first. A dry, dark attic or cellar, with plenty of ventilation, makes a good place for keeping fruit. The fruit should not be heaped up. Each apple, pear, or other fruit should lie by itself, not touching its neighbour, and every few days each one should be examined, to see if it has begun to decay. If it has, it should be removed, so that it may not contaminate the rest. Wrapping each one in paper separately is a good plan, and if this is done the fruit need not be examined at such frequent intervals as when it is stored unwrapped. If these hints are followed, apples may be kept fresh for many months. Indeed, some fruits, such as winter pears, require to be kept for some time to get thoroughly ripe, as they do not ripen on the tree.

Another way to keep fruit fresh, even for a longer time than is possible by the precautions we have stated, is in clean glass jars with the help of the liquid called formalin and cotton-wool. A few drops of formalin are poured into the bottom of the jar, and a layer of cotton-wool is then put in. Upon this a layer of fruit is placed, then a layer of cotton-wool, followed by another layer of fruit, and so on, until the jar is filled. Then some more formalin is put at the top, and the jar is tightly sealed. The fruit in this case should not be pressed down, or the skin may be broken, and this would hasten decomposition. Hard fruits, such as apples and pears, can be kept successfully by this method, but not soft fruits, such as strawberries or plums. Sometimes chloroform is used in the place of formalin, but it affects the taste of the fruit.

In America fruit-preserving has become quite a domestic art. The fruit is pared, cored, and put into glass jars, which are then filled with a hot, thin syrup, and firmly sealed.

On board ship and elsewhere fruit is often kept in cold storage—that is to say, the temperature of the room or box in which the fruit is stored is kept at about 32 degrees Fahrenheit, which is freezing-point, by means of ice or refrigerating machinery. But this involves the use of expensive machinery or other apparatus, and is not suitable for an ordinary person who merely wishes to enjoy the lusciousness of fresh fruit a few weeks longer than he would otherwise be able to do.

A LITTLE VEGETABLE GARDEN

WHAT TO DO AT THE END OF JULY

WHEN we gather vegetables we ought to know the quantity that will be required, so that we do not take too many. Of course, the surplus can be used next day, but they will not be nearly so nice as they would be if they were freshly cut. In fact, when people say, as they often do, that home-grown vegetables are so much nicer than bought ones, it generally means just the difference that this absolute freshness implies. Even in lifting the early potatoes, only sufficient for the day should be dug up. Always dig up potatoes with a fork instead of a spade, as the spade will probably cut several of them in pieces.

The same rule applies to lettuces or radishes; never cut more than are required for the next meal. In the northern districts of the country a small sowing of cabbages may be made during the last day or two of the month, but in warmer districts the end of the first week in August is a better time for the work, as we do not want the plants to get too forward before the cold weather.

We must see that growing crops are well watered, and keep down the weeds. This is rather a slack time in the garden, so that any work that will keep us forward during a busier season may now be done. Thus, there are our pots and pans. These may have become green or otherwise soiled on the outsides; they should have a thorough scrubbing, and then be allowed to dry. Cleanliness in all gardening operations counts for much, and clean pots are especially desirable. We must never put soil into a wet pot. If we mean to take cuttings of geraniums in greater quantity than we have pots for, we may use boxes, and pot the plants later.

We may not have any potting to do at present, but we may consider here the proper way to pot a plant. We take, then, a clean, dry pot, and we put in the pieces of broken pots that are to form the drainage. Often the novice in gardening will make the mistake of not supplying sufficient drainage. We ought to put in two or three or four pieces, and more if the pot be a very large one. Then over the drainage we lay a morsel of moss, or quite old straw manure, so that the soil does not get down between the crocks and clog the drainage. On the top of this we put the soil—a portion of it first; then we arrange the plant so that it is quite in the centre of the pot, adding the rest of the soil, and pressing it firmly about the roots of the plant. But we must *not* fill the pot with soil level with the brim; we must leave half an inch or more, according to the size of the pot, so that, when we water, we may really pour the water *into* the pot, which we could not do if it were filled to the brim with soil. This is quite an important little matter.

Perhaps we have bought, or made, a small garden frame. Such a frame is very useful, especially during the winter, when it will give capital protection to young lettuce plants, the seed of which we shall soon be sowing. Now is the time to give a coat of paint to the frame, as this helps to preserve the woodwork from rain and weather.

To return to our flower garden for a moment, there is a piece of garden work that is often required, but which has not yet been described. Let us suppose we have a fine young rhododendron, of which we have tried to strike a cutting and failed. Let us try another method of procuring a young plant from it. We will *layer* a piece to see if we can induce it to root. We make a slanting cut in a branch that is near the ground, making the cut close under a joint, being careful not to cut the branch through; then we lay it along the ground and cover it firmly with extra soil, the branch still, of course, being unsevered. In due time roots will be formed, and, when thoroughly established, we may cut it free and transplant it. But, whereas the rhododendron requires a couple of years before severing, the carnation in our border can be layered at this very season, and by the beginning of October it will be ready to transplant; but then one is a hard, woody branch, the other a soft, juicy stem. The branch or stem being layered should be firmly pegged to the ground before being covered with soil: a hairpin is often used to peg carnation layers.

HOW TO SLEEP

EVERYONE should know how to sleep, for there are several rules which often make all the difference to the value of sleep, or to our getting any sleep at all. For instance, it is not good to sleep on the back. There are many reasons for this, but all we need know is that sleep on the back is more liable to be disturbed in various ways, including nightmare, than sleep on the side. The heart comes nearest the surface on the left side of the body, and also the stomach is mostly on that side, so most people find that they sleep best on the right side, and many people cannot sleep at all on the left side. Another good rule for practically everybody is to go to bed to sleep, not to think or to read, and to get up in the morning when called. Of course, we vary in what suits us, and some elderly people find it best to read themselves to sleep with a book in bed; and other people, not in good health, certainly are better to have breakfast in bed. But the best rule for quite healthy people, and especially young people, is to go to bed to sleep, and to get up promptly when wakened.

THE NEXT THINGS TO MAKE AND TO DO ARE ON PAGE 3913.

There is no more charming wild flower than the foxglove, a single plant of which produces over a million seeds. Were it not for birds and insects, foxgloves would soon overrun the whole country.

HOW PLANTS TRAVEL

CONTINUED FROM 3736

We already know some of the ways in which the parent plants send their seeds into the world, so that they may have a chance of finding fresh ground where they will thrive. But, in addition to the various interesting methods described on page 3733 of this book, there are other clever plans that plants have hit upon in order to make their way in the world.

Some of the weeds that now overrun our fields were not known here until recent years; and, on the other hand, some of our own weeds have managed to get taken to distant countries where they were unknown. Some of these weeds, too, when they get into a new country, flourish so well that, for a time at least, they become a greater nuisance than they have been in their own land.

Some of our native plants have contrived to travel thousands of miles, even to far South Africa and Australia; and some of them have been met with on lonely islands in the South Seas. How do they get so far to these islands, where the sea is all around? They go in ships, just as we should go. Some of them get carried by birds, perhaps in easy stages, instead of going direct, and a few have been taken out by emigrants, who thought they would like to have some of their favourite wild flowers growing around their houses in the new country to remind them of the dear old home they have left. In this way, years ago, a Scotsman who was leaving his native land to settle in Australia took with him some seeds of the thistle and other plants. He sowed the seeds, and they came up so well in the new soil that his thistles were greatly admired, and every Scottish settler for many miles around came to see the familiar plant of the old country, and all begged for seeds. In a few years thistles had taken such a hold of that part of the country that the farmers ceased to admire them, and felt not at all inclined to bless the patriotism of the man who had first sown its seeds there.

In much the same way the watercress was taken to New Zealand. In this country the watercress is never a nuisance, because it grows on the muddy margins of streams, or across the beds of shallow brooks. But in its new home it rapidly spread from the brooks and streams into the rivers, and grew so large and strong that it filled up the waterways and prevented boats from travelling on them. These plants were taken abroad with a purpose; but there are many that have

been taken by man without his knowledge. Years ago, before North America was so well peopled by white men as it is to-day, one of the European weeds, the plantain, found its way there. Nobody would want to take such a plant with him, for it has no showy flowers, and is not eaten by us. But its seeds went from Europe with the emigrants, and wherever they made their homes, on the prairies and in the backwoods, the plantain sprang up, and the Red Indians gave it a name; they called it the "White Man's Foot."

How the "White Man's Foot" was brought to America

They merely jested when they thus hinted that it was the white man's foot on the earth that caused this plant to spring up. It is very likely that the first plantain that grew in North America really did spring up in that manner; but there was no magic in it. Probably some English farm labourer, going to try his future in America, packed up the heavy boots in which he had walked behind the plough at home, and did not put them on again until he reached the new land. Now, if we suppose that a little of the English earth was clinging to the soles of those boots, the mystery is solved. It is almost impossible to take up from our fields as much of the surface soil as will cover a quarter without having in that soil a number of the seeds of some of our weeds.

Sir Joseph Hooker once related a little story that made this matter very clear. An exploring party, of which he was one, landed on a lonely island at the other side of the world. No one lived on this island, and the visitors thought that they were the first men that had ever set foot upon it. But soon they came upon some of the common English chickweed, and, using the patches of this plant as a guide, they came to a low mound which was covered by it.

A spade that carried English chickweed across the world

The mound was a grave in which a British sailor, who had died at sea, had been buried by his mates. It is almost certain that the spade with which the grave was dug had already been used where chickweed grew, and a few of its seeds had clung to it, to be brushed off on this far-away island, where it germinated and grew. There are many other stories of the way in which our common weeds have got introduced to other countries where they were unknown before, and we must say something of the way in which plants make their way without the aid of man. Many of the winged seeds, and those that have parachutes or sails, are blown for long distances by the wind. The wind drops them, and they sprout and grow into plants which produce flowers and seeds. The second crop of seeds get blown farther in the same course, or in several directions, and year by year that plant is found farther and farther away from its old home.

The seeds of waterside plants are carried for miles by water—perhaps for hundreds of miles—before they are caught by the muddy bank. The cocoa-nut, that we know so well, is borne by the sea, securely wrapped in its great coat of fibres, from island to island in the Southern Seas. Scarcely has a coral island risen to a level with the surface of the sea before numbers of cocoa-nuts are washed upon it, and there they grow and soon cover the island with tall, graceful palms.

A cupful of mud that contained five hundred different kinds of seeds

Hooked seeds cling to the fur of beasts and the feathers of birds, and get carried far away. Birds not only carry seeds, but also bits of water-weeds clinging to their feet; and many birds fly enormous distances when they migrate. Years ago Mr. Darwin caught some birds of this kind and washed the mud off their feet, and from it he grew a large number of plants, the seeds of which were in the mud.

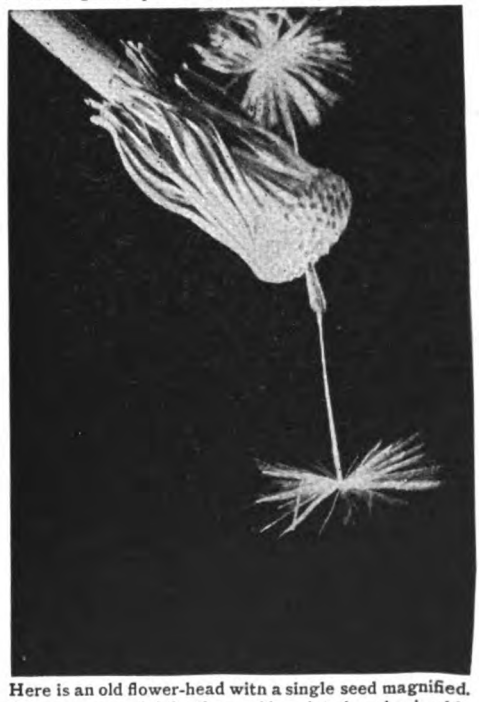
To show how easy it was for birds to pick up seeds when they hopped along the shores of muddy ponds—into which millions of seeds are washed in rainy weather—he took three table-spoonfuls of mud from a little pond and put it into a breakfast-cup. There were many seeds in it, and as they sprouted and got large enough for him to see what they were, he pulled each one up to allow room for others, and kept count of them. From that small quantity of mud he obtained no less than 537 plants of various kinds!

THE DANDELION'S LITTLE PARACHUTES

The dandelion, that we all know so well, was much used and appreciated by our forefathers for salads and as a medicine. Even now it is taken in the form of dandelion coffee by people who suffer from indigestion.

Here is the plant after it has gone to seed. The yellow petals have fallen off, and in their place there is a fluffy head, looking like a ball of down, that only needs a gentle puff of wind to carry it right away.

This fluffy head is made up of many seeds, to each of which is attached a number of tiny hairs, that spread out like a parachute, and cause the seed, when it falls to the ground, to drop seed downwards.



Here is an old flower-head witn a single seed magnified. As we can see plainly, the seed is pointed, and so is able to enter the soil when it falls. The parachute, catching every puff of wind, works the seed well into the ground.

We cannot walk through a field or wood in summer or autumn without a large number of seeds clinging to our clothes, and though some of these will get knocked off again very soon, we shall find many still clinging to us when we reach home. Even in the case of those seeds that have been shaken off, the purpose of the plant has been served by their being carried some distance away, where they may find a more suitable soil and have more room to grow.

DIFFERENT KINDS OF PLANTS THAT GROW IN DIFFERENT KINDS OF PLACES

Nearly all plants have their special liking for certain places in which to grow, and the people who make a study of them — *botanists* they are called—know the exact kind of place in which to look for any plant they want. There is one set of plants we shall never find away from watersides or marshy ground. Others we must look for on peat-bogs. The field flowers differ from those we find in the woods, and these again are unlike those we get on the hillside or on the open downs.

The mountains, with their shallow soil and bare rocks, have their own plants, and many of them will not grow in the richer and deeper soils of the lowlands. Some of them go farther than this in their likes and dislikes; they must have a distinct kind of soil. For instance, this one will only grow upon soils of which chalk or lime forms part; that one will surely die if planted in soil that contains any lime. One must have a loose, sandy soil, while another prefers a stiff loam or clay, and so on.

Then they are particular about the amount of light they get, one insisting upon shade, another thriving only in full, hot sunshine. One likes to have the salt-laden sea-breezes blowing upon it; another cannot live anywhere near the sea. And thus it is that in the tropics we shall find a set of plants quite distinct from those in cold climates, or in our own temperate region.

WHY SOME OF OUR PLANTS WILL GROW ONLY IN HOTHOUSES

That is why, when plants are brought to our gardens from India and South America, we have to grow them in hothouses; and the plants from those countries warmer than our own, but not so hot as the tropics, we protect in greenhouses, where they will be safe from any touch of frost. The plants that grow high up in the mountains we call Alpine plants, and for these in gardens we have to provide blocks of stone under which their roots will find coolness and moisture, that enables the leaves and flowers to stand the full glare of the sun.

A number of plants can only grow on the remains of other plants. An example of this kind will be found in the bird's-nest orchid, which has no leaves, and is of one dingy yellow-brown colour all over. Other plants fasten their roots to the roots of their neighbours, and rob them of the food these roots are getting from the soil. But these have green leaves, and work up the raw food they have stolen into leaf-stuff and flower-stuff. They are known as root parasites, and in this class come the cow-wheats, the eyebright, the red and yellow rattles, and the house-wort, that grows in marshy places.

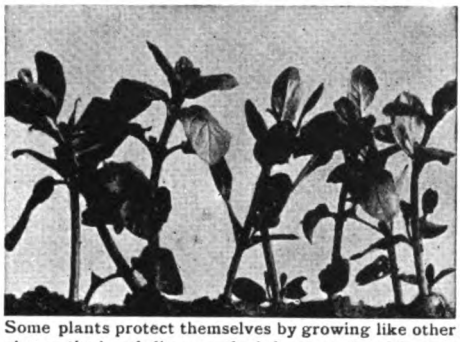
The mistletoe is only a partial parasite, for it has green leaves. Other plants, like the broom-rapes and the dodders, are wholly parasites, taking everything they require from their victims, and not putting forth a single leaf, or having a spot of green colour about them. All these we shall have to talk about in their proper turn.

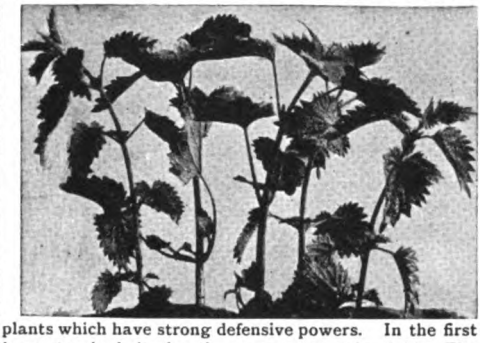
THE MOULD, WITHOUT WHICH PLANTS WOULD STARVE TO DEATH

We have already seen that all but the very tiniest of plants must have *mould* to grow in, and that this must be made by plants. If we were to dig up pure clay or sand from deep down in the earth and try to grow plants in it, we should find most of them would fail. They would be starved because, although they want this clay or sand, they want other things mixed with it.

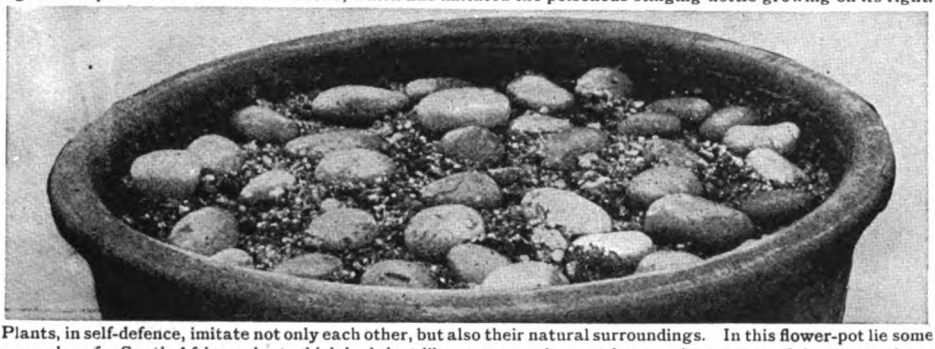
Mould consists of such soil broken up and well mixed with the decaying leaves and stems of other plants. This makes it lighter and holds moisture, and so enables the fine rootlets to work their way among it and feed upon it. The different amounts of this decaying matter is known as *humus*, and the different kinds suit it for plants of various tastes; for plants have likings just as animals have. The plants that thrive in a beech-wood will not live in a pine-wood, though the amount of light and moisture may be much about the same in both places.

PLANTS THAT IMITATE OTHER PLANTS

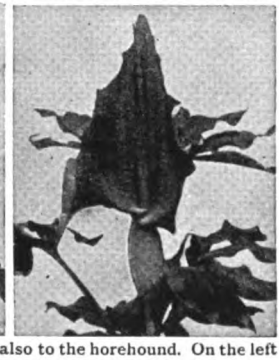




Some plants protect themselves by growing like other plants which have strong defensive powers. In the first pi ture the brook-lime, on the left, saves itself from being eaten by imitating the peppermint on its right. The right-hand picture shows the dead-nettle, which has imitated the poisonous stinging-nettle growing on its right.



Plants, in self-defence, imitate not only each other, but also their natural surroundings. In this flower-pot lie some examples of a South African plant which look just like stones, and so cattle pass them over and do not eat them.

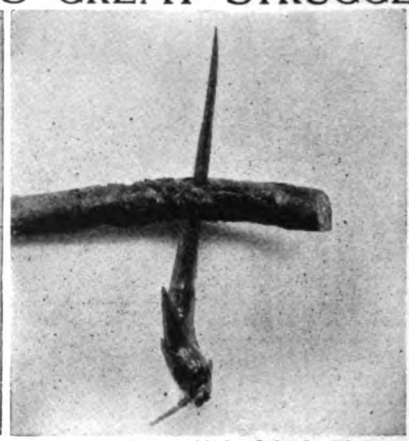


The objectionable stinging-nettle is not only a protection to the dead-nettle, but also to the horehound. On the left of the first picture here we see the horehound growing beside and resembling its adopted guardian. The right-hand picture shows us a dragon's arum, which attracts insects by throwing out an odour like decaying meat.

This is another picture of the stinging-nettle and the dead-nettle growing side by side. The tinging-nettles can be recognised by their flowers, although, when the dead-nettle blooms, its flowers are more attractive.

THE PLANT'S GREAT STRUGGLE FOR LIFE

This picture shows a curious New Zealand fungus growing **out of the body of a caterpillar.**



In the vegetable world the fight for life is as keen as among animals. Here is a grass-blade **that has forced its way through a hard root.**

Here is a tropical fungus like that on the left growing out of **an insect which it has killed.**

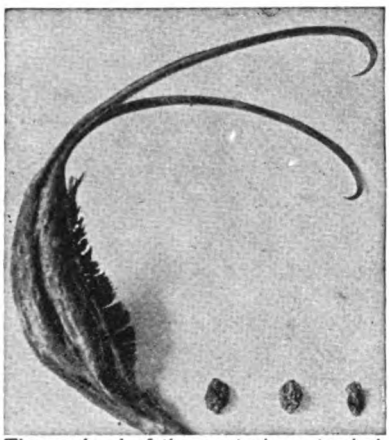
One of the best known of our climbing plants is the convolvulus, shown in this picture. It will take hold of any other plant in order to lift itself into the sunlight.

The dodder not only climbs round other plants, as it is doing round the nettle here, but it attaches itself to its victim by means of circular discs, and feeds upon it.

The dodder is a strange plant, for it has no leaves, and this is why it is compelled to draw its nourishment from the plant upon which it grows. In this picture we see the dodder climbing up and strangling the heather.

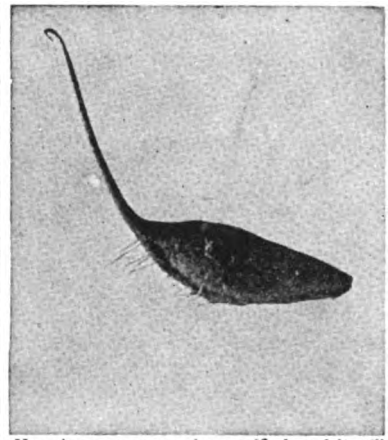
Here we see part of the same dodder magnified. The flowers belong to the dodder, and not to the heather.

SEEDS THAT TRAVEL LONG DISTANCES



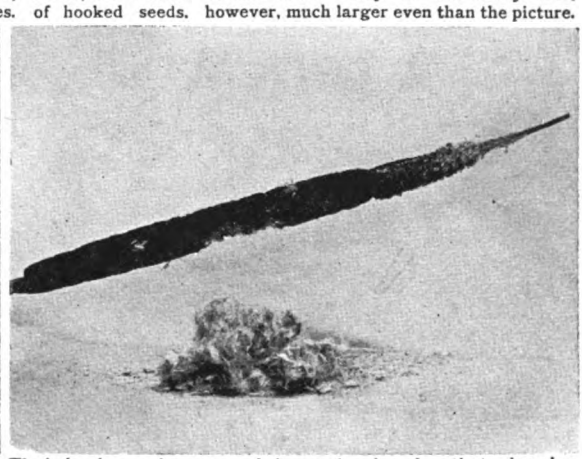
The seed-pod of the martynia, a tropical plant, has two hooks, that catch in the coats of animals. The pod is thus carried about, and the seeds are sown in new places.

An English plant, the common hedge avens, has a head of hooked seeds.

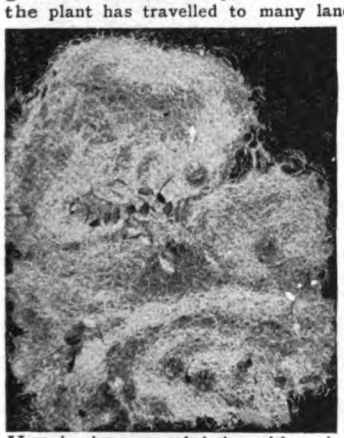


Here is an avens seed magnified, and it will be seen that it bears a striking resemblance to that of the martynia. The martynia is, however, much larger even than the picture.

The seed of the Bathurst burr, shown here, gets into the wool of sheep, and in this way the plant has travelled to many lands.

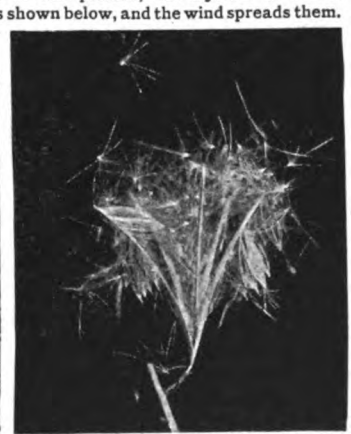


The bulrush, growing commonly in marshes, is a plant that, when ripe, as seen in the upper part of this picture, has myriads of seeds. These become separated, as shown below, and the wind spreads them.



Here is sheep s wool, laden with various seeds. In Australia, the Bathurst burr, carried thus, has become a pest.

The willow herb has its seeds contained in a kind of pod, that is shown in the picture.



When ripe, the willow herb's pod, seen in the last picture, bursts, and the seeds are blown long distances by the wind.

We have possibly noticed how large a number of seeds one plant will produce in a season. In all plants the number is very large; in many, such as the oak-tree, which drops thousands of acorns every autumn, it is enormous.

WHY PLANTS THAT SCATTER MILLIONS OF SEEDS DO NOT SPREAD OVER THE EARTH

A single poppy-head bears countless tiny seeds. One foxglove plant scatters one million and a half of seeds. Yet in the place where they grow, if we watch year by year, we shall find that the numbers of poppies and foxgloves are always much about the same. The wood will appear to have only as many oaks in it this year as it had ten or a hundred years ago, and the reason for this is quite plain.

Every plant has its enemies—slugs, insects, birds, and beasts—eating its seeds, killing its seedlings, or hurting the full-grown plants. The greater the dangers a plant has to face, the larger will be the number of seeds it has to produce to ensure that one of its children shall grow up to produce flowers and seeds in its turn, and so keep the race going. If in autumn we look in our wild gardens where foxgloves bloomed, we shall find the seedlings coming up thickly together.

Now, if we consider how large the leaves of the foxglove become before they send up their flowering stems, we shall see that there is not room for them all. What happens? They are not all as strong and healthy as each other, and so the strongest and best fitted to produce flowers starve and smother the sickly ones. That is one reason why the stem of the foxglove sways in the wind, and the mother plant tries to throw her seeds as far away as she can, to give all her children a chance of coming up. But still the sickly ones must suffer and eventually be starved to death. It seems very cruel, but it is only in that way that the fine vigour of the race can be kept up.

THE THOUSANDS OF LITTLE OAK-TREES THAT FAIL IN THE RACE OF LIFE

Of the many thousands of acorns that an oak will ripen in a good year, by far the greater number never have a chance to sprout. Deer, pigs, squirrels, and mice will eat them; so will the jay and other large birds. But still, if we go to the oak-woods in May or June, we can see that vast numbers of seedling oaks, a few inches high, have shot up, and are standing in crowds under the trees. Very few of them will be alive at the end of the year, for some of the many oak-eating insects will destroy them; rabbits will nibble them to the roots; and the only acorns that appear to have a chance of becoming trees are those that have been dropped by a jay or crow in the field or hedgerow, and just one here and there that has managed to fall in some spare corner of the wood. All this huge supply of acorns is to ensure that the race of oaks does not die out.

If a big oak happens to have been cut down by the woodmen, or is struck down by lightning, it leaves a great clear space in the wood that used to be shaded by its long branches. In such a space thousands of seedling oaks will come up, and as they will here get more light and air than they would where the trees are close together, they will grow more quickly and strongly, and a few will escape their enemies.

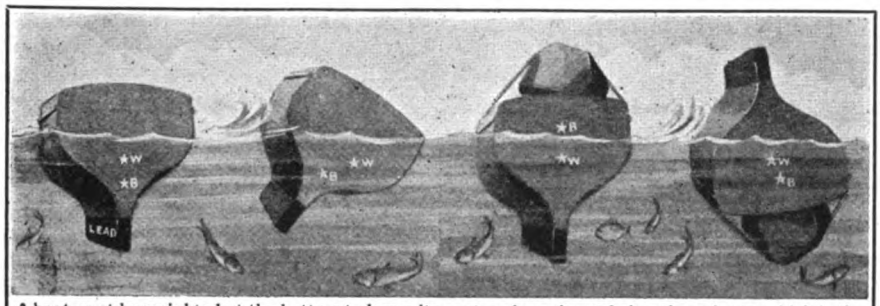
HOW THE OAKS OF THE FOREST WORK TO PRESERVE THEIR RACE

But the struggle will still go on between these little oaks, until the one strong tree will conquer the others, and fill up the space that the fallen tree once filled. To fill up that space, and to extend the wood on all sides, all the oak-trees in the wood produce their crops of acorns.

What has been said about the foxglove and the oak applies to all plants. Scarcely one attains to its full size without having fought hard for its life. Even if an acorn is dropped in the middle of a field by a jay, or gets there by some other means, it has to fight in its early days with the grasses, and if it succeeds in getting to the height of a few feet, it may be so injured by horses or cattle nibbling at it or trampling upon it that it dies.

Thousands of young trees spring up from winged seeds, far away from their parents, and struggle for years against browsing sheep and cattle, and never get higher than the grass. But if they happen to fall into the hedgerow, and can grow up to the light, they may in the end win the fight, and, by shutting out light and air from the older bushes, kill those that attempted to kill them.

The next Stories of Plants is on page 3949.



A boat must be weighted at the bottom to lower its centre of gravity, B, below the point W, which is the centre of gravity of the water the boat displaces. The boat will then rock, but not capsize. If, however, by putting a weight on deck we raise the centre of gravity, B, above W, then the boat easily capsizes.

THE PULL OF THE EARTH

CONTINUED FROM 3817

THERE is a term connected with gravity which we must understand, and which we shall find will throw light on what we have already learnt about equilibrium; this is the term *centre of gravity*. In the case of any object there must be, as we can imagine, a point around which the whole of it could be balanced. The amount of matter in the body would be so disposed all round that point that if it were hung by a thread at that point it would stay at that position. It would balance perfectly around that point. It is as if all the matter of the body were really massed together at that point, which we call its centre of gravity. Probably, a better term would be *centre of mass*.

If we have a round ball made throughout of the same material, the centre of the ball will be its centre of gravity. Now, suppose we take a square board with the intention of finding its centre of gravity, assuming, of course, that the board is made of the same material and is of the same thickness throughout. We want to fix a single thread to the board at one point, so that the thread will support the board evenly. That point will, of course, be the centre of gravity.

Now, we all know what a diagonal is—the line joining opposite corners of such a board. If we draw the two diagonals, the point where they cross each other is the centre of gravity. That is all very well, but it is not quite so easy to find the centre of gravity of a body that has an irregular shape. Suppose, for instance, that, instead of a square board or a round one, we had one of a quite irregular shape, and wished to find the point at which we could support it so that it would lie evenly. Let us pick up the board, tie a string somewhere to its edge, and let it hang steady. If we draw a line straight down the board continuing the line of the string, the centre of gravity will be somewhere in that line. Now, it is a very interesting fact that we should be able to say this for certain, and we must try to understand why we can do so. When the board hangs steady from the string, there must be, as in any other case of equilibrium, a balance of forces.

These forces, of course, are the earth's gravity pulling downwards and the tension of the string pulling upwards. Now, as these two forces act equally and oppositely, the centre of gravity must be somewhere in the line of them, just as if the whole substance of the board were at that point. If the centre of gravity were to one side of the line of the string, then we should have what is called a *couple* of forces. Gravity and the pull of the string would be acting not in the same straight line, but oppositely, in parallel lines, and this couple would mean that the board was twisted

until the centre of gravity *did* come to lie under the string. The only real way to understand this—which is perfectly simple—is to draw a diagram for ourselves as we read it. First, we can draw a diagram showing what really happens; then we can draw a diagram showing the board with the centre of gravity to one side of the line downwards from the string, and then we can see how the couple of forces is bound to rotate the board, or turn it round.

How we may find the centre of gravity of a board or a plate

Now, we laid down no condition as to the point that the board was to be hung from. No matter from where it is hung, what we say is true. Suppose, then, that we hang it up again from some second point, and then draw the line downwards from the string, the centre of gravity will be somewhere in that line, as we said before; but we know that it is also somewhere in the first line we drew. Now, there is only one point which is common to both lines, and that is the point where they cross each other. The centre of gravity of the board is there. If we have made our experiment precisely, and if we can attach a wire or a thread to the board exactly at that point, we shall find that the board will hang evenly around it on all sides. Of course, we can try the same experiment with a plate, or a slate, or any similar flat object.

If we take such a complicated thing as the human body, we certainly cannot easily find its centre of gravity. The body is very irregular in shape, and it is made of different parts of very various densities. Nevertheless, it has been possible by long study to find one deeply interesting fact. It is one of the most important facts of the whole body, because upon it depends the erect attitude, which means the freedom of the hands from purposes of walking, and the chance to make use of them for all the great human purposes.

The great joint that divides our body into two halves

If we look sideways at anyone walking, or if we look sideways at a skeleton, we can see that the hip-joints make the great joint which really divides the body into an upper half and a lower half. As we know very well, the trunk and head and arms can swing backwards and forwards upon the lower limbs at the hip-joint. Now, suppose a line were drawn straight down to the earth from the centre of the hip-joints of anyone who is standing. We have here a problem, as we can readily see, which is very like the problem of the board hung by a string. In this case the support is below instead of above, but that does not really matter.

Now, if we understand the principle of the centre of gravity, we can see for certain what must happen to the upper part of the body, as it is supported through the straight line down to the earth, from the hip to the heel. If the centre of gravity of the trunk and head lies so that the line dropped from it to the earth will lie in front of the line from the hip-joint to the earth, then the body must topple forwards. The centre of gravity of the upper part of the body is found in front of the line through the hip-joints in the case of all animals, like the horse and cat, and so on; and that, of course, is why they have to walk as they do. Only by muscular effort and a certain degree of skill can a horse or a dog walk on its hind legs.

Why it is difficult for babies and animals to stand upright

Even of the man-like apes, including the wonderfully erect gibbons, which we may see any day at a zoo, it is true that the centre of gravity lies in front of the hip-joints. They can walk very well for a time, but it costs them labour, and they can scarcely stand. A very small baby is in exactly the same plight as these animals.

But as the baby grows the curve of its backbone changes in such a way that the centre of gravity of the trunk now lies, as it does in all of us, behind the hip-joints. The two lines dropped to the earth, one from the hip-joints and the other from the centre of gravity, are parallel, and the forces acting through them make a couple, so that the trunk and head tend to rotate and roll backwards to the ground at the hip-joints, leaving the legs erect. That, however, is a thing which we never saw accomplished even by the most skilful acrobat.

It is prevented by the special development in our bodies of two huge bands of fibres, one in front of each hip-joint, which prevent the trunk from rolling backwards under the influence of

gravity. This beautiful arrangement means that, instead of standing upright only by muscular effort and careful balancing, we can do so in virtue of self-acting mechanical principles. Someone may say that all this is not the story of the earth; but the body is the child of earth, and the laws of the earth act in it and upon it, and the body is successful in so far as it obeys and is adapted to the laws of the earth.

WHEN A THING IS STEADY AND WHEN IT IS UNSTEADY

We have already studied the various kinds of equilibrium, and we learnt their names—stable, unstable, and neutral; but, of course, we ought to be able to define the exact causes which make the difference between the equilibrium that is stable, or steady, and those that are neutral and unstable. Our study of the centre of gravity can explain this. The simple law is that anything is in a state of stable equilibrium when the centre of gravity is raised by any disturbance, but it is in a state of unstable equilibrium if anything that disturbs it lowers the centre of gravity.

All this is quite plain if we think of the centre of gravity as the place where all the stuff of the body may be supposed to be collected. Now, if anything is going to raise that point, as, for instance, when we push against something hung from a string, then, when the force which raised it ceases to act, gravity, which is always acting, pulls the body back to where it was before. This is true of any case of stable equilibrium, such as that of the slightly tilted tumbler. But, of course, if the displacing force pulls down the centre of gravity, then, when it ceases to act, we cannot expect the body to return to its original position. There is nothing to make it do so; on the contrary, there is gravity to prevent it doing so.

HOW AN EGG MAY ILLUSTRATE THE THREE KINDS OF EQUILIBRIUM

We can illustrate these cases, and also the case of neutral equilibrium, by an egg. For a second we may balance an egg on its point, but the tiniest disturbance will be fatal, because it means lowering the centre of gravity. This is a case of unstable equilibrium. On the other hand, we may have the egg resting on its side. Of course, we are assuming all the time that the yolk of the egg is unbroken and lies in the centre of the egg. Now we may roll the egg along the table by pushing it, just as we may roll a billiard-ball. In a little while, friction and the resistance of the air will stop it, and it will come to rest. The force we applied neither raised nor lowered the centre of gravity of the egg; its equilibrium was neutral.

But if, instead of rolling the egg by a push at one side, we try to tilt it at either end, we find that, after tossing up and down for a little, it will come back to its old position. So far as disturbances in that direction are concerned, it is in a state of stable equilibrium.

The reason is that when we tilted it we raised the centre of gravity, and when the finger was removed it returned to that position in which the centre of gravity is as low as possible. That, of course, must be the stable position—the position in which the egg as a whole is as near the centre of the earth as possible, so that the whole force of gravitation is on the side of resisting any disturbance of its equilibrium.

A COMMON ACCIDENT THAT HAPPENS WHEN MEN FORGET THE LAWS OF BALANCE

These questions of equilibrium and centre of gravity are of the gravest practical importance whenever the balancing of anything matters. Take, for instance, one of the most common and fatal of accidents, which happens somewhere or other almost every day in the year. We are constantly hearing that a rowing-boat has been upset and someone has been drowned. Except where the boat has been in a rough sea, it is safe to say that in every such case someone has been very foolish. There is a simple rule of safety which we all ought to know and act upon, or we may be responsible for the loss of one or more lives. The rule is that not more than one person at a time should be standing up in a rowing-boat, and the lower even he crouches when he moves about the less danger there will be.

We see that this is a problem in equilibrium, and the whole question of equilibrium depends upon the centre of gravity. If the centre of gravity of the boat were in its keel, as in the case of those little toy bottles with half a bullet at their base, then the boat could not be so easily upset; it could be tilted or turned upside down, but, at any rate, it would right itself at once.

This is a case, of course, of stable equilibrium, where any disturbance means the raising of the centre of gravity. When we build what is called a lifeboat, we provide it, among other things, with a very heavy iron keel, which means that the centre of gravity is kept so low that, with the help of other arrangements, the boat, even when it is upset, has the power to right itself. But in an ordinary rowing-boat there is no heavy iron keel, and the greatest factors in determining where its centre of gravity lies are the bodies of the occupants.

WHY A ROWING-BOAT CAPSIZES WHEN PEOPLE STAND UP IN IT

Directly we stand up, the centre of gravity of the boat is raised, and any disturbance is more likely to lower it, which means that the boat goes over. If two persons stand up together—especially if there is no one else in the boat—then the risk is very grave indeed. The accidents that cause the loss of so many precious young lives every year are usually due to two persons standing up in a small rowing-boat, in defiance of the laws of equilibrium and centre of gravity.

It required a great deal of experiment and labour to discover how to make a boat which should have its centre of gravity so placed that practically nothing could upset it. The great English Lifeboat Institution has such a boat, and probably the most essential thing about it is the lowness of its centre of gravity. There are other qualities, such as the power of righting itself when upset. This makes the modern lifeboat perhaps the most wonderful vessel that man has yet put upon the water, small though it be.

All these questions apply, of course, to great ships as well as to small ones, and it is a matter of the utmost importance that the weight of a ship shall be rightly distributed. It would be very easy to build a ship so that, when a wave made it roll, its tendency would be to roll over still further and overturn.

HOW THE BALLAST OF A SHIP PREVENTS IT FROM TURNING UPSIDE DOWN

Many of us have been in a ship at some time or other, and we know that, when it rolls to one side because of a wave, it rolls back again. It may never have occurred to us why it does this. Now that we have learnt Newton's first law of motion, we shall naturally ask this question. The wave started the ship moving in a certain direction; according to Newton's first law, the ship must go on moving in that direction until something stops it.

When we look into the matter, we find that the weight of the water which the ship has displaced acts upon the ship and tends to right it; but for this to happen—and no vessel could live in anything but the smoothest sea if it did not happen—the centre of gravity of the ship must be low down. We see to this by having the ship's hold filled with ballast, something dense and heavy, the result of which is to lower the centre of gravity of the whole ship.

If for any reason the ballast were taken and thrown out of the ship, the result would be the same as that of standing up in a rowing-boat. It means that the centre of gravity of the ship is raised, and this means that the equilibrium is less stable, and that it is much more liable to be overturned than it was before.

THE LIFEBOAT & THE SUBMARINE, THAT ARE BASED ON THE LAWS OF EQUILIBRIUM

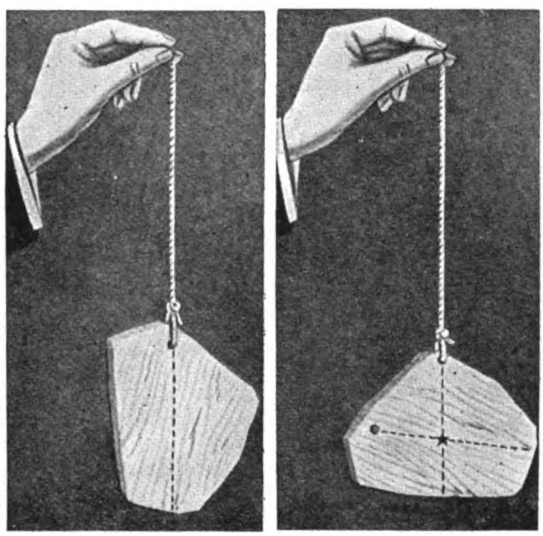
Long experience has enabled men who build ships to understand and master these principles in practice, so that, as we have seen, such a vessel as the modern lifeboat is scarcely capable of being improved upon. In recent years, however, men have been trying to make new things, the success of which depends upon the laws of equilibrium.

Submarine boats are an instance of this, and most of the difficulties have been mastered in this case; but it is the making of vessels to fly in the air that furnishes us with the greatest difficulties. The case of an ordinary balloon is quite simple, provided that the air be still. The ballast and the bodies of the passengers ensure that the centre of gravity shall be very low down, but even in such a case as this a violent wave of wind may upset the balance.

The problem becomes much more serious and difficult when we take the case of a flying machine, and it is a great mistake to suppose that anyone has yet accomplished the feat of making a flying machine whose equilibrium can be relied upon no matter what the wind is doing. This will be quite plain if we go back to our principles. They are very simple, but they apply everywhere. We know that all motion

depends upon forces; we know that all rest and all states of balance depend upon the relations between forces; and we know that there is a constant force of gravitation always acting, and always acting equally.

So long as we have only gravitation to reckon with, our problem is simple. Anyone can make a boat that will float on still water, or a balloon that will stay right way up in still air, or even a toy flying bird that will do the same. The difficulty arises when we have to reckon with other forces which vary to any degree in their direction and in their strength. That is the problem for the machine that is to fly in the air no matter what the air is doing. The case is made specially difficult by the fact that, if the machine is to carry passengers, it must retain its right position always; it cannot be allowed to turn turtle, and then right itself. Probably no one can yet say whether this problem can really be solved.



These pictures show how we may find the centre of gravity of any flat object, such as a board. We suspend it from any part of its edge, and when it comes to rest draw a line in continuation of the line of string. Now we suspend the board from another point and draw a second line. The centre of gravity is situated exactly at the place where the two lines cross.

A similar problem, but one that is not quite the same, has been perfectly solved by birds and by many insects. The bird is subject to all the laws which we have discussed; gravitation is constantly acting upon it; the pressure of the air downwards and of the air in motion, which we call wind, acts upon it also.

The bird has solved the problem of making power in itself that will keep it up even though the specific gravity of its body is greater than that of the air. Now that problem has been perfectly solved by man in modern flying machines. This is not to say that man has made or ever will make engines that have as much power in proportion to their weight as a bird's muscles have. But the difference is only one of degree. There yet remains the thing which the bird can do, and which we cannot do, and that is to fly and remain in almost any state of the air. Long and careful study has been made by many observers of the manner in which the bird balances itself. Photography has been called in for this purpose, and something has been learnt by the kind of photography that is used for making living pictures.

So far as we can learn at present, it seems that the success of the bird is a success which only life itself can achieve, at any rate, in such degree. However this may be, it is worth noting that the bird, like a lifeboat, can, in a sense, turn turtle, and then right itself again. The bird recovers, and so does the lifeboat; but the case of the lifeboat, and still more of the flying machine, is very different from that of the bird, because these contain passengers, and they must be thrown out. It is as if we asked a bird to fly with a penny balanced on its back, and the conditions were not merely that the bird should fly no matter what the wind was, but also that it should not permit the penny to slip off. No bird could accomplish such a feat, but that is the feat which we ask the flying machine to accomplish. We are still very far from enabling the machine to do what the bird can do, but it is certainly worth our while to remember that we are also asking it to accomplish not merely what the bird does, but what even the bird cannot perform.

We must not leave the subject of gravitation without referring to what is, perhaps, the most important of all

the questions it raises—much more important than even the question of flying machines or the floating of boats. If it be true that here is a force which acts for ever, tending to pull every particle of matter in the universe towards every other particle, why does not all the matter in the universe get collected into one great solid ball?

THE OLD IDEA THAT EVERYTHING MUST HAVE A BEGINNING AND AN ENDING

Now, there are two possible answers to the question, and it is necessary for both of them to be carefully considered and explained.

The first answer we now know to be not the true one, but we ought to know that it was once believed in. It might be that this process of gathering together all the matter in the universe under the influence of gravitation was indeed going on, and had been going on since the universe was first made, but that there had not yet been time enough for it to result in gathering everything together into a solid ball, though there might be no doubt that such an event must eventually happen. This has in it the ideas of beginning and ending, which people have always been inclined to believe, and which, at first, most of us will think must be true.

Not very many years ago these ideas of beginning and ending were supposed to be strongly supported not only by the existence of the law of universal gravitation, but also by the behaviour of heat and power in the universe. Men thought that the universe was like a machine which had been wound up and set running, but which in course of time must run down. One great thinker stood out against these notions and said they could not be true, and that was the famous English scientist, Herbert Spencer.

THE TRUTH THAT A FAMOUS ENGLISH THINKER TAUGHT ABOUT THE UNIVERSE

Spencer declared that, though we could not name or discover them yet, there must be other forces in the world which acted in the opposite direction to those we knew, such as the force of gravitation, and that the history of things in general must be a rhythm, like a wave going on and on for ever, "from everlasting to everlasting," as the Bible says of God.

And now we have come to see that Herbert Spencer was right, and that the answer to the great question of what must be the consequence of gravitation is not what people supposed. Of course, we do not need telling that if what we have asserted about gravitation be true, and if there be no other force opposing it, it *must* at last have the consequence of gathering together all the matter in the universe. But we are now beginning to know something of the wonderful forces, also always at work, which act in other directions.

For instance, we have lately proved to absolute certainty the existence of a force which is exerted by light, by radiant heat, and by other forms of radiation, which are known as *radiation pressure*. Everyone has heard of gravitation and very few people have heard of radiation pressure, but the one is just as important as the other.

A FORCE THAT ACTS AGAINST THE PULL OF GRAVITATION AND SCATTERS THINGS

This pressure acts in exactly the opposite direction to gravitation, and though, under the conditions we know best, gravitation is much the stronger and has its way, yet under other conditions, which are just as common in the universe taken as a whole, radiation pressure is stronger than gravitation, and has its way, with the result that the matter which is acted upon, instead of being gathered together into a solid ball, is scattered.

The discovery of radiation pressure is of great importance to science, but it is of far greater importance in another way, and that is why we must mention it here. Its highest importance is that it helps to give us right ideas of the universe itself. Without this discovery the law of gravitation was a great argument in favour of the old view which looked upon the universe as something which had been made and set running, and must eventually run down.

There is an infinite difference between this notion and the true one, for which there is now the support of science as well as of pure reason—that the universe has neither beginning nor ending, but is an eternal thing, the eternal revelation of the Eternal God, who sustains it "from everlasting to everlasting."

The next part of this is on page 3941.

SHUFFLE-SHOON AND AMBER-LOCKS

BY

EUGENE FIELD

Shuffle-Shoon and Amber-Locks
Sit together, building blocks;
Shuffle-Shoon is old and grey,
Amber-Locks a little child;
But together at their play
Age and youth are reconciled,
And with sympathetic glee
Build their castles fair to see.

"When I grow to be a man,"
So the wee one's prattle ran,
"I shall build a castle so—
With a gateway broad and grand;
Here a pretty vine shall grow,
There a soldier guard shall stand;
And the tower shall be so high,
Folks will wonder, by-and-by!"

Shuffle-Shoon quoth: "Yes, I know;
Thus I builded long ago!
Here a gate, and there a wall,
Here a window, there a door;
Here a steeple wondrous tall
Riseth ever more and more!
But the years have levelled low
What I builded long ago!"

So they gossip at their play,
Heedless of the fleeting day.
One speaks of the Long Ago
Where his dead hopes buried lie;
One with chubby cheeks aglow
Prattleth of the By-and-by;
Side by side they build their blocks—
Shuffle-Shoon and Amber-Locks.

JOHN ANDERSON

This famous song is a love-song—with a difference. In it Robert Burns pictures a happy couple not at the beginning of their married life, but towards its close; and it says much for the enduring affection each has cherished for the other that the old lady is able to sing so tenderly of her "jo," or sweetheart. The Scots words in the song are easy to understand, but "brent," it may be said, means smooth, or unwrinkled; "pow," head, and "canty," happy.

JOHN ANDERSON, my jo, John,
When we were first acquent,
Your locks were like the raven,
Your bonnie brow was brent;
But now your brow is bald, John,
Your locks are like the snow;
But blessings on your frosty pow,
John Anderson, my jo.

John Anderson, my jo, John,
We clamb the hill thegither,
And mony a canty day, John,
We've had wi' ane anither;
Now we maun totter down, John;
But hand in hand we'll go,
And sleep thegither at the foot,
John Anderson, my jo.

SILVIA

It has been said that when a character in one of Shakespeare's plays "favoured" the audience with a song, this happened when the company contained a man who was both an actor and a singer. Though these songs were not numerous, they were perfect examples of the divine art; and one of the most charming is that here quoted. It occurs in "The Two Gentlemen of Verona," and has been set to music worthy of it by the famous German composer Schubert.

WHO is Silvia? What is she,
That all our swains commend her?
Holy, fair, and wise is she;
The Heaven such grace did lend her,
That she might admired be.

Is she kind as she is fair?
For beauty lives with kindness:
Love doth to her eyes repair,
To help him of his blindness;
And, being help'd, inhabits there.

Then to Silvia let us sing,
That Silvia is excelling;
She excels each mortal thing
Upon the dull earth dwelling.
To her let us garlands bring.

THE SHEPHERD BOY SINGS IN THE VALLEY OF HUMILIATION

John Bunyan, whose "Pilgrim's Progress" is the greatest allegory in the world, wrote very little verse. But the snatches of poetry he introduced here and there into his story were quaintly expressed. The song which he placed in the mouth of the Shepherd Boy in the Valley of Humiliation, however, is entitled to the highest praise, even on the literary side. The lad had already found out the secret of true happiness and peace. A contented mind is a continual feast.

HE that is down needs fear no fall,
He that is low no pride;
He that is humble ever shall
Have God to be his guide.

I am content with what I have,
Little be it or much;
And, Lord, contentment still I crave,
Because Thou savest such.

Fulness to such a burden is
That go on pilgrimage;
Here little, and hereafter bliss,
Is best from age to age.

THE VOICE OF TOIL

William Morris, born 1834, died 1896, was famous as a poet, as a writer of romance, and a lover of the fine arts. His sympathy with the poor and oppressed in the battle of life was so deep and abiding, that much of his writing is devoted to advocating the cause of the workers. The following poem is, in a way, a battle-cry to do service on behalf of the poor.

I HEARD men saying: Leave hope and praying,
All days shall be as all have been;
To-day and to-morrow bring fear and sorrow,
The never-ending toil between.

When earth was younger, mid toil and hunger,
In hope we strove, and our hands were strong;
Then great men led us, with words they fed us,
And bade us right the earthly wrong.

Go read in story their deeds and glory,
Their names amidst the nameless dead;
Turn them from lying to us slow-dying
In that good world to which they led;

Where fast and faster our iron master,
The thing we made, for ever drives,
Bids us grind treasure and fashion pleasure
For other hopes and other lives.

Where home is a hovel and dull we grovel,
Forgetting that the world is fair;
Where no babe we cherish, lest its very soul perish;
Where mirth is crime, and love a snare.

Who now shall lead us, what god shall heed us
As we lie in the hell our hands have won?
For us are no rulers, but fools and befoolers,
The great are fallen, the wise men gone.

I heard men saying: Leave tears and praying,
The sharp knife heedeth not the sheep.
Are we not stronger than the rich and the wronger,
When day breaks over dreams and sleep?

Come, shoulder to shoulder, ere the world grows older!
Help lies in nought but thee and me;
Hope is before us, and the long years that bore us
Bore leaders more than men may be.

Let dead hearts tarry, and trade and marry,
And trembling nurse their dreams of mirth,
While we the living our lives are giving
To bring the bright new world to birth.

Come, shoulder to shoulder, ere earth grows older!
The Cause spreads over land and sea;
Now the world shaketh, and fear awaketh,
And joy at last for thee and me.

THE CONCLUSION

Sir Walter Raleigh was accused of treason and imprisoned in the Tower, where he was beheaded in 1618. While lying in prison he wrote a "History of the World." He also wrote several poems, of which we give here a short specimen, the melancholy tone of which points to its having been composed within the shadow of death. But Sir Walter's high courage does not desert him, and his faith in God is supreme.

EVEN such is time, that takes in trust
Our youth, our joys, our all we have,
And pays us but with earth and dust;
Who in the dark and silent grave,
When we have wander'd all our ways,
Shuts up the story of our days;
But from this earth, this grave, this dust,
My God shall raise me up, I trust.

THE LAST MAN

In this famous poem, Thomas Campbell presents, with fine dramatic effect, a picture of the earthly end of the human race. It is a pure effort of the imagination, and is not given as a serious suggestion of how life will die away on this planet. Its real value is to illustrate how indestructible is man's faith in the future life, to which our existence here is only the first chapter of a story that goes on for ever.

All worldly shapes shall melt in gloom,
The Sun himself must die,
Before this mortal shall assume
Its Immortality!
I saw a vision in my sleep,
That gave my spirit strength to sweep
Adown the gulf of Time!
I saw the last of human mould
That shall Creation's death behold,
As Adam saw her prime!

The Sun's eye had a sickly glare,
The Earth with age was wan,
The skeletons of nations were
Around that lonely man!
Some had expired in fight—the brands
Still rusted in their bony hands;
In plague and famine some!
Earth's cities had no sound nor tread;
And ships were drifting with the dead
To shores where all was dumb!

Yet, prophet-like, that lone one stood
With dauntless words and high,
That shook the sere leaves from the wood
As if a storm passed by,
Saying, We are twins in death, proud Sun!
Thy face is cold, thy race is run,
'Tis Mercy bids thee go;
For thou ten thousand thousand years
Hast seen the tide of human tears,
That shall no longer flow.

What though beneath thee man put forth
His pomp, his pride, his skill;
And arts that made fire, flood, and earth
The vassals of his will!
Yet mourn I not thy parted sway,
Thou dim discrowned king of day:
For all those trophied arts
And triumphs that beneath thee sprang
Heal'd not a passion or a pang
Entail'd on human hearts.

Go, let Oblivion's curtain fall
Upon the stage of men,
Nor with thy rising beams recall
Life's tragedy again:
Its piteous pageants bring not back,
Nor waken flesh, upon the rack
Of pain anew to writhe;
Stretch'd in disease's shapes abhorr'd
Or mown in battle by the sword,
Like grass beneath the scythe.

Ev'n I am weary in yon skies
To watch thy fading fire;
Test of all sumless agonies,
Behold not me expire.
My lips that speak thy dirge of death—
Their rounded gasp and gurgling breath
To see thou shalt not boast.
The eclipse of Nature spreads my pall—
The majesty of Darkness shall
Receive my parting ghost!

This spirit shall return to Him
Who gave its heavenly spark;
Yet think not, Sun, it shall be dim
When thou thyself art dark!
No! it shall live again, and shine
In bliss unknown to beams of thine,
By Him recall'd to breath,
Who captive led Captivity,
Who robb'd the grave of Victory—
And took the sting from Death!

Go, Sun, while Mercy holds me up
On Nature's awful waste
To drink this last and bitter cup
Of grief that man shall taste—
Go, tell the Night that hides thy face
Thou saw'st the last of Adam's race,
On Earth's sepulchral clod,
The darkening universe defy
To quench his Immortality,
Or shake his trust in God!

THE SOWER

In the fables of old Greece there is a story of a Phœnician prince named Cadmus, who, attacking a dragon, succeeded in killing it. Taking out the teeth of the dragon, he sowed them in a plain, upon which armed men suddenly arose from the ground, and when he threw a stone among them they instantly began to fight each other, and so continued till all were killed except five, who helped Cadmus to build his city. The old legend is used by modern poets when they wish to suggest the origin of strife and anarchy, as in the following poem by James Russell Lowell.

I saw a sower walking slow
Across the earth, from east to west.
His hair was white as mountain snow,
His head drooped forward on his breast.
With shrivelled hands he flung his seed,
Nor ever turned to look behind;
Of sight or sound he took no heed;
It seemed he was both deaf and blind.
His dim face showed no soul beneath,
Yet in my heart I felt a stir,
As if I looked upon the sheath
That once had held Excalibur.
I heard, as still the seed he cast,
How, crooning to himself, he sung:
"I sow again the holy past,
The happy days when I was young.
"Then all was wheat without a tare,
Then all was righteous, fair, and true;
And I am he whose thoughtful care
Shall plant the Old World in the New.
"The fruitful germs I scatter free,
With busy hand, while all men sleep;
In Europe now, from sea to sea,
The nations bless me as they reap."
Then I looked back along his path,
And heard the clash of steel on steel,
Where man faced man, in deadly wrath,
While clanged the tocsin's hurrying peal.
The sky with burning towns flared red,
Nearer the noise of fighting rolled,
And brother's blood, by brothers shed,
Crept curdling over pavements cold.
Then marked I how each germ of truth,
Which through the dotard's fingers ran,
Was mated with a dragon's tooth,
Whence there sprang up an armèd man.
I shouted, but he could not hear;
Made signs, but these he could not see;
And still, without a doubt or fear,
Broadcast he scattered anarchy.
Long to my straining ears the blast
Brought faintly back the words he sung:
"I sow again the holy past,
The happy days when I was young."

THE PEN AND PENCIL OF KATE GREENAWAY

ALTHOUGH so many ladies have devoted themselves to the dainty art of illustrating and writing children's books, perhaps Kate Greenaway, who was born in 1846 and died in 1901, is the only one who became famous all the world over in this way. She was the daughter of a London wood-engraver, and studied art from her earliest years. There is such a charm and freshness about all her little drawings, and so quiet a touch of humour, that both old and young find them full of entertainment. Her simple verses are of less importance than her delightful illustrations, but they are tuneful and appropriate. A selection from her sketches and verses is given on these two pages and elsewhere by permission of the publishers, Messrs. Frederick Warne and Company.

LOOK over the wall, and I'll tell you why [by.
The King and the Queen will soon pass
Madams and masters, look this way;
The King and his Court ride past to-day.
The Queen has a robe that is gold and red;
She is stately, and sits with a crown on her head;
And four very little boys after her go,
To do as she bids them—they never say "No."
The banners are waving, the soldiers are drumming;
'Tis indeed a fine sight that, I tell you, is coming!
So, if you look long enough over the wall,
You'll see a great deal, if you do not see all.

UNDER the window is my garden,
Where sweet, sweet flowers grow;
And in the pear-tree dwells a robin,
The dearest bird I know.
Tho' I peep out betimes in the morning,
Still the flowers are up the first;
Then I try and talk to the robin,
And perhaps he'd chat—if he durst.

PRINCE FINIKIN and his mamma
Sat sipping their bohea;
"Good gracious!" said his Highness,
What girl is this I see? ["why,
"Most certainly it cannot be
A native of our town."
And he turned him round to his mamma,
Who set her teacup down.

But Dolly simply looked at them;
She did not speak a word.
"She has no voice," said Finikin;
"It's really quite absurd."

Then Finikin's mamma observed,
"Dear Prince, it seems to me,
She looks as if she'd like to drink
A cup of my bohea."

So Finikin poured out her tea,
And gave her currant-pie.
Then Finikin said: "Dear mamma,
What a kind Prince am I!"

THREE little girls were sitting on a rail,
Sitting on a rail,
Sitting on a rail;
Three little girls were sitting on a rail,
On a fine hot day in September.

What did they talk about that fine day,
That fine day,
That fine day?
What did they talk about that fine day,
That fine hot day in September?

The crows and the corn they talked about,
Talked about,
Talked about;
But nobody knows what was said by the crows,
On that fine hot day in September.

FIVE little sisters walking in a row;
Now, isn't that the best way for little girls to go?
Each had a round hat, each had a muff,
And each had a new pelisse of soft green stuff.

Five little marigolds standing in a row;
Now, isn't that the best way for marigolds to grow?
Each with a green stalk, and all the five had got
A bright yellow flower and a new red pot.

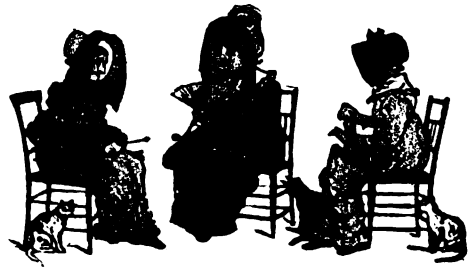
POLLY'S, Peg's, and Poppety's
Mamma was kind and good;
She gave them each, one happy day,
A little scarf and hood.

A bonnet for each girl she bought,
To shield them from the sun;
They wore them in the snow and rain,
And thought it mighty fun.

But sometimes there were naughty boys,
Who called to them at play,
And made this rude remark: "My eye!
Three Grannies out to-day!"

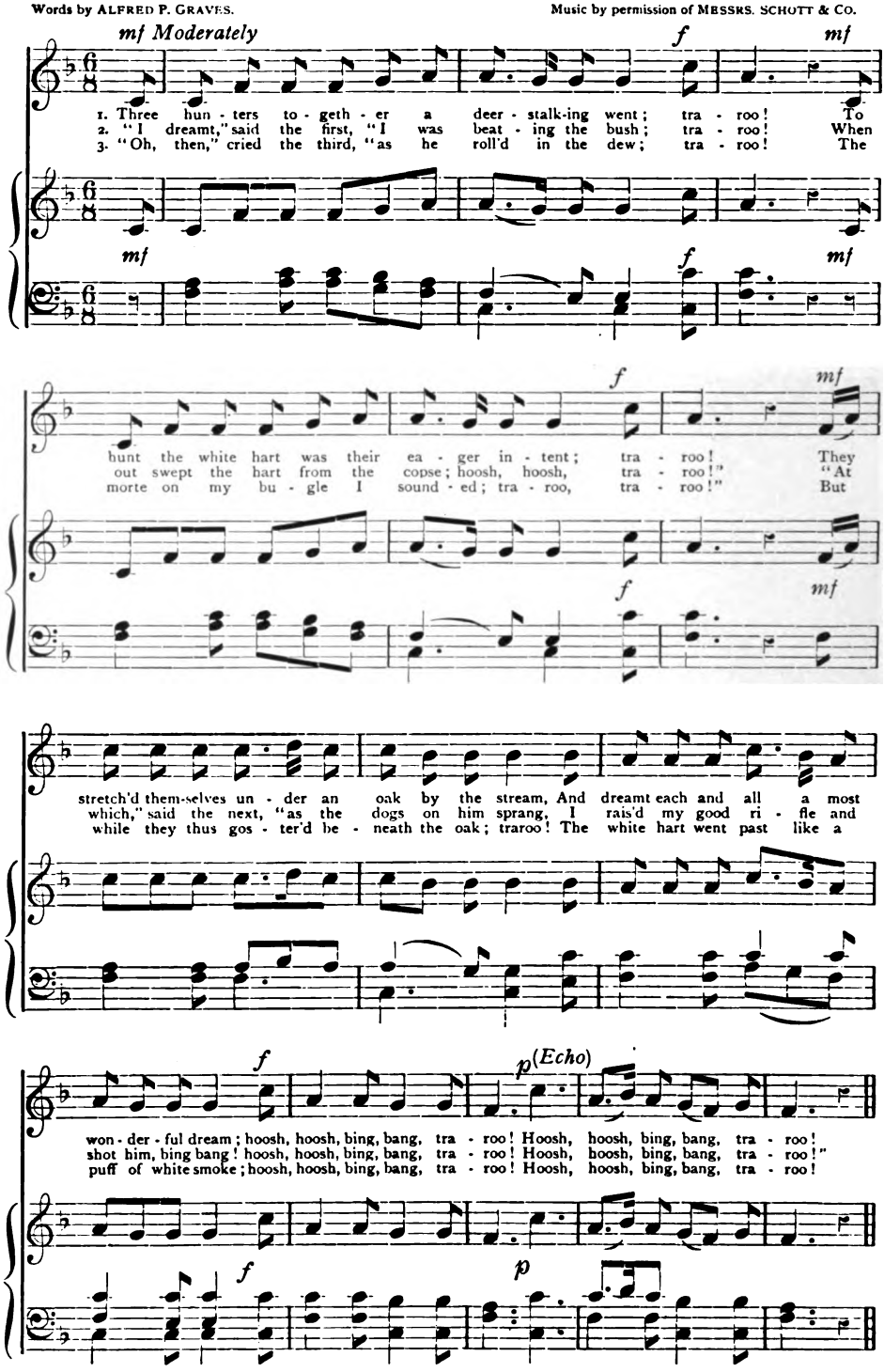
LITTLE Miss Patty and Master Paul
Have found two snails on the garden wall.
"These snails," said Paul, "how slow they walk!
A great deal slower than we can talk.
Make haste, Mr. Snail, travel quicker, I pray;
In a race with our tongues you'd be beaten to-day."

THREE tabbies took out their cats to tea,
As well-behaved tabbies as well could be;
Each sat in the chair that each preferred,
They mewed for their milk, and they sipped and purred.
Now, tell me this, as these cats you've seen them—
How many lives had these cats between them?



THE WHITE HART

Words by ALFRED P. GRAVES. Music by permission of MESSRS. SCHOTT & Co.



THE MILLER AND HIS PETS

CONTINUED FROM 3648

SOME long time ago a band of robbers settled in a lonely hut on Bagshot Heath. They waylaid travellers and took their money, and broke into farmhouses and robbed the farmers. One afternoon, when the old miller who lived in the windmill on the edge of the heath had gone to town, the robbers entered his rooms, stole all his savings, and set fire to the mill.

The old miller returned in the evening and found that he was ruined. But what grieved him most of all was that the robbers had stolen all his provisions. He did not mind going without a meal himself, but there was no food for his donkey, his dog, his cat, and the two ducks. Being a lonely man, he had made great pets of all his animals. He loved them very dearly, and, rather than see them starve, he resolved to set them free. So he said to them :

" You see the robbers have taken everything. There is no hay for the donkey, no meat for the dog, no milk for the cat, no corn for the ducks. I can't keep you here, my pets, and let you die for want of food. Go out together, and see if you can't pick up something to eat on the heath."

All the animals were very sad at leaving their master, and they wandered about looking for food and lodging. At last they came to the hut where the robbers were sitting at a table eating their supper by the dim light of a tallow candle.

" Here's a chance to get a good shelter for the night," said the dog. " Crouch down in the bushes, all of you, and make as much noise as you can. See if we can't frighten these thieves out of their senses."

The animals hid themselves in the brushwood around the hut, and began to make a fearful din.

" Hee-haw, hee-haw ! " bellowed the donkey, with a voice like thunder.

" Mee-ow-u-ou ! " shrieked the cat.

" Bow-wow-grrr ! " roared the dog.

" Qua, qua, qua ! " squawked the ducks.

The robbers were terribly frightened by the strange uproar ; and when one of the ducks flew in and knocked the candle over and left the hut in darkness, the men were terror-stricken, and they rushed out and fled wildly in all directions.

The animals then joyfully entered the hut, and made a good meal out of the robbers' supper, and then laid down to sleep. The donkey slept by the door, the dog underneath the table, the cat above it, and the two ducks on the top of the open door.

When the robbers recovered from their fright, their captain determined to see what had happened at the hut. He went back, and, finding the place very dark and silent, he crept

through the open door, but with the noise the animals at once awoke.

The dog sprang out and bit his leg. Then, as he passed the table, the cat jumped up and scratched his face. The two ducks spread out their wings and flapped about his head, and when at last he staggered to the door, the donkey gave him a terrific kick, and sent him flying into a prickly mass of furze and bramble. The robber captain crawled away, and told his men that a murderous gang had captured their hut, and would kill them if they went back.

"One of them," he said, "stabbed me in the leg. Another just managed to graze my face with his knife. Three or four of them flapped a cloth about my head and tried to wrap it round me and stifle me. And just as I thought I had got safely away, someone struck me in the back with a great sledge-hammer, and pretty nearly killed me."

"We'd better leave this neighbourhood at once," said his men.

They hurried away, more frightened than ever, and never did they return to Bagshot Heath.

In the morning, the dog noticed that the ground had been disturbed in a corner of the hut. Scratching up the earth, he found a large sack full of money. This the donkey managed to hoist on his back, and the dog and the cat and the two ducks proudly marched by his side across the heath to the ruined mill. With the money that the animals brought to him, the old miller repaired and stocked his mill, and there he lived happily and quietly with all his pets, and often amused himself over the story of the capture of the robbers' treasure.

A SON OF A GUN

SCREWWORM sat down among the toadstools and opened the book which is called "Gnome Gnobodies." In America we have a book called "Who's Who." It tells us about famous people. In fairyland they have "Gnome Gnobodies," which is just the opposite.

In "Gnome Gnobodies" the gnomes read about gnomes who are not famous.

Screwworm opened his enchanting book at the letter T, and turned the pages till he came to the name Tompin. This is what he read:

"Tompin is a duffer, and flighty. He was born on the planet Mars in the year 12, and emigrated to the earth in the year 1066. As he was neither woman nor man, he attached himself to the Normans and followed them to England. His favourite recreation is stroking his chin. He neither reads nor writes. He earns his living by doing nothing. His favourite residence is the muzzle of naval guns, which he prefers to old-fashioned clubs. He can swim backward as well as forward. His present address is H.M.S. Dreadnought, At Sea."

When Screwworm had read this account of Tompin, he said: "That's the little fellow for my money. The very thing."

Something stirred at his side. He looked up, and saw the Lizard.

"Good-evening," said Screwworm.

"Certainly," answered the Lizard.

"How did you find Landsend?"

"Rocky," replied the Lizard.

"Now listen to me," said Screwworm, resting his arm on a toadstool and regarding the Lizard over his glasses. "Do you, or do you not, know Tompin?"

"I've seen him," answered the Lizard, "but I can't say as how I know him. We don't speak. He's a son of a gun."

"Quite so. Now, I've invented a gun myself; it's a beauty. It fires sea-shells on the seashore. The shells are sells; that is to say, the sea-shells it sells are seashore sells. Not Wilkie's, for those are Bard—but Winkle's! Do you follow?"

"You mean to say, your gun fires winkle-shells which are sells; that is to say, they are not genuine. You are using slang?"

"You have me. I use slanguage for this reason—the mouth of my gun likes it. If you want to make a hit nowadays, you must use slang. I want to make a hit. Do you know what I want to hit?"

"Hush!" whispered the Lizard. "He's here!"

Screwworm turned his head. Tompin was regarding him over a toadstool.

"Good-evening, monsieur. Do you speak German?" asked Screwworm.

Tompin said nothing. His old face had a set smile, which was neither merry nor pleasant. You might have called it a blind smile, or even a dumb smile.

SOMETHING STIRRED AT SCREWWORM'S SIDE, AND, LOOKING UP, HE SAW THE LIZARD

"Don't you speak at all?" demanded Screwworm, frowning.

After waiting a long time for an answer, Screwworm got up, laid "Gnome Gnobodies" on the ground, and, walking over to Tompin, said: "Come hither, little bird!" Very gently he took the left ear of the old fellow between his finger and thumb and led him away.

"Monsieur," said he, "I have a gun."

Tompin stopped dead. His face quite lighted up.

"What's the matter?" asked Screwworm.

"I am saved," said Tompin—"if it's at all fatherly."

"Explain yourself."

"The British Navy," said Tompin, "is practising gun-fire just now. There is not a single gun that is safe for me to sit in. The consequence is——"

"Yes."

"I am an orphan, a waif, a homeless and fatherless wretch. It is immensely sad."

"You are welcome to sit in my gun. It shall adopt you."

"It won't go off—and leave me?"

"I shouldn't think so."

"Oh, thanks! For this relief, much thanks. Get you to a gunnery, as Shakespeare says. I'm your boy. Let us fly to it."

They continued their way. When they came to Screwworm's gun, the face of Tompin became very green.

"It smells fishy!" he said suspiciously.

"Try it," said Screwworm.

"I don't like the smell," muttered Tompin, poking his nose in the muzzle and sniffing deeply. "It suggests seashells. Too much mussel to be strong. I fear I might be oystered. If you will allow me, I will limpet."

He made to go on, but Screwworm caught him by the ear again, and said:

"Try it, poor orphan."

"You are sure you don't mind?" asked Tompin.

"Tut!"

"Here goes, then!" cried Tompin; and he jumped into the muzzle of Screwworm's gun.

Quick as lightning Screwworm ran to the back of it, struck a match, and applied it to the touch-hole.

A bright flame shot into the air.

Something went *fiz-z-z-z-z*! And then there was a tremendous explosion.

The air for miles became black with winkle-shells.

Thousands and thousands of gnomes came rushing up from all directions. They found the gun lying on the ground, smoking hot, and emitting yellow and green flames. Screwworm and Tompin were nowhere to be seen.

Scramblepipe, who was among the company, exclaimed:

"Something has happened!"

At that moment the Lizard appeared in the midst of the group.

"My dear friends," said he, "if you will be patient for a few moments, you will see a sight worth seeing. Let me explain. This gun is so perfectly balanced that the pace of the discharge is equal to the pace of the recoil. The force is exactly equal to the circumference of the earth. Now, what has happened? Tompin from the muzzle of the gun and Screwworm from the breech of the gun are now at this moment going round the world. Do you follow me? If you wait a moment, you will see what I mean."

Scarcely had the Lizard ceased speaking when Tompin from the east and Screwworm from the west appeared in the air, rushing towards each other at a pace so furious that all the gnomes instantly rushed for shelter under the toadstools.

"They passed each other half-way round the world," said the Lizard. "Now they will meet and embrace. Bang!"

At that minute the two bodies came together with a whack! Then they fell straight to the earth in each other's arms.

"Did you enjoy it?" asked Screwworm breathlessly.

"You have impressed me," said Tompin, with sincere admiration.

For a moment he regarded the gun, still smoking on the ground; then, with a rush of tears to his eyes, and quite overcome with emotion, he fell upon one knee, laid his arms lovingly about the gun, and, pressing his cheek against it, exclaimed:

"Papa, papa, I have come back to you!"

The Lizard turned to Screwworm, and said:

"Let us leave him where he is. The poor orphan is now at peace."

BRER RABBIT AND THE TAR-BABY

BRER Fox was always trying to catch Brer Rabbit; but Brer Rabbit was mighty pert and spry, and he never let Brer Fox catch him. So Brer Fox pretended to be friendly, and asked Brer Rabbit to come to dinner with him. But Brer Rabbit did not come; he knew what was going to be eaten at that dinner. Brer Fox then thought of something else. He went to work and got some tar and some turpentine, and fixed up a thing which he called a Tar-Baby. He set up this Tar-Baby by the road near Brer Rabbit's house, and laid low beneath the bramble-bushes near by to watch what would happen.

By and by Brer Rabbit came prancing along, lippity-clippity, clippity-lippity, as saucy as a jay-bird. When he saw Tar-Baby he sat up on his hind legs in astonishment.

"Good-morning," says Brer Rabbit, very politely and nicely. "Fine weather this morning," says he.

Tar-Baby said nothing, and Brer Fox he laid low.

"Are you deaf?" said Brer Rabbit. "I can shout if you are."

And he shouted. But Tar-Baby kept on saying nothing; and Brer Fox he winked his eye slowly, and laid low.

"Howdydo?" says Brer Fox, coming out of the bushes. "You seem rather stuck up, Brer Rabbit, this morning."

At last Brer Rabbit raised his fist and hit Tar-Baby on the side of her head. And there his fist stuck in the tar, and he couldn't pull it away.

"Let me go, or I'll strike you again!" says Brer Rabbit. And he hit out with his other hand, and that stuck on Tar-Baby.

Brer Rabbit kicked out angrily with his feet, and they got stuck on Tar-Baby. Then he butted her with his head, and his head also got fixed.

"Howdydo?" says Brer Fox, coming out of the bushes, and looking as innocent as a dicky-bird. "You seem rather stuck up, Brer Rabbit, this morning."

And then Brer Fox rolled about the ground and laughed.

"I expect you'll come to dinner with me now, Brer Rabbit," says he. "We're going to have some nice roast rabbit. You won't play any more tricks on me. You're too saucy by far. Who asked you to strike up an acquaintance with this Tar-Baby? Now you're going to have a warm time, as soon as I can get some firewood together."

Then Brer Rabbit began to talk mighty humble.

"I don't care what you do with me, Brer Fox," says he, "so long as you don't fling me on those prickly bramble-bushes."

"It's too much trouble to light a fire," says Brer Fox. "I'll have to hang you."

"Hang me, or drown me!" says Brer Rabbit. "I don't mind. But for pity's sake don't fling me on those prickly bramble-bushes."

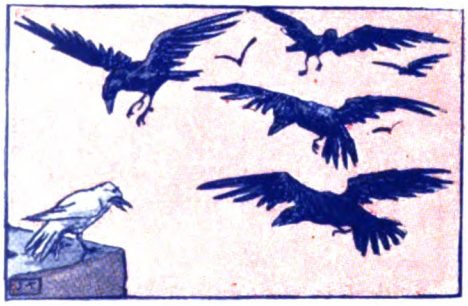
But Brer Fox wanted to hurt Brer Rabbit as much as he could, so he took him by the hind legs and pulled him off Tar-Baby, and flung him right into the middle of the prickly bramble-bushes. There was a considerable flutter where Brer Rabbit struck the bushes, and Brer Fox wanted to see what was going to happen. By and by he heard someone calling up the hill, and there he saw Brer Rabbit sitting on a log, combing the tar out of his hair with a chip of wood.

"I was bred and born in a bramble-bush, Brer Fox—bred and born in it," says Brer Rabbit, with a laugh. And with that he skipped off home as lively as a cricket.

FABLES OF ÆSOP THE SLAVE

THE JACKDAW AND THE PIGEONS

A JACKDAW who noticed that the pigeons in a certain dovecot were very well fed, whitewashed his feathers



in order to look as much like a dove as possible, and went and lived among them. The pigeons, so long as he kept silent, did not recognise him; but at last he forgot that he was acting the part of a dove, and began to chatter like a jackdaw.

Then the pigeons saw what he was, and drove him away. But when he flew back to the church tower, the other jackdaws, not knowing him in his discoloured feathers, also drove him away, so that he had no home to go to.

It is no use pretending to be what we are not, for we are sure to be found out sooner or later.

THE THIEF AND THE DOG

A THIEF came to rob a certain house one night, but was disturbed by a fierce dog, which kept continually barking at him.

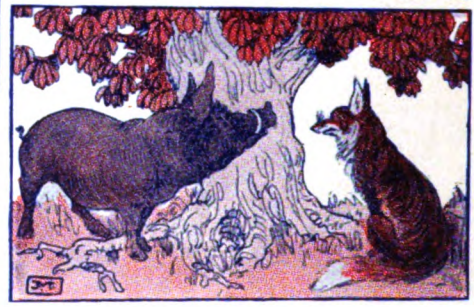
Upon this, the thief, thinking to stop his mouth, threw him a piece of meat.

The dog refused it with indignation, telling him that before he only suspected him to be a bad man, but now that he had tried to bribe him he was certain of it. He added that the care of his master's house was entrusted to him, and he should never stop barking while such a man was about.

When anyone offers us a present not to tell, we may be sure that there is something wrong.

THE FOX AND THE BOAR

A BOAR was one day sharpening his tusks against the trunk of a tree. A fox who happened to be passing at the same time asked why he was making



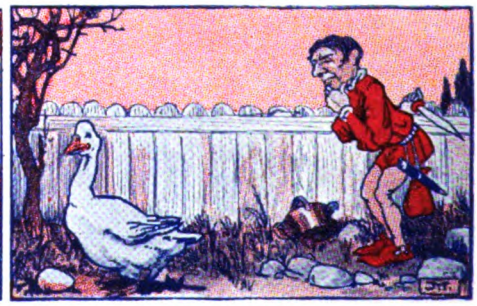
these warlike preparations when there was no enemy near.

The boar answered: "That is quite true, Mr. Fox; but we should always sharpen our weapons while we have leisure, for in time of danger we shall have something else to do."

Never be idle. We can always find something to do.

THE GOOSE WITH THE GOLDEN EGGS

A MAN once had a goose which laid a golden egg every day; but he was so greedy that he was not content with this, and so he killed the goose and cut her open, thinking that he would find



enormous riches inside her. But, to his great disappointment, he found nothing; and after the goose was killed, of course, no more golden eggs were laid.

We gain nothing by being greedy.

THE ANGLER AND THE LITTLE FISH

A MAN was angling in a river and caught a very small perch. As he was taking out the hook, and going to put the fish into his basket, it opened its mouth and began to beg for pity, and to ask that he would throw it into the river again.

The man asked why he should do so. The fish answered:

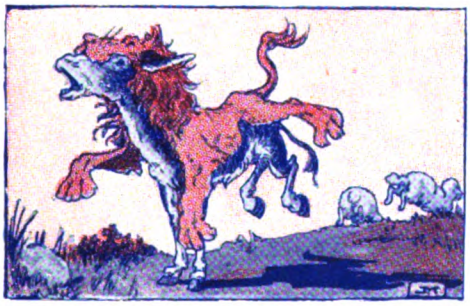
"Because at present I am so very young and small and not worth much; but if you throw me back into the river you may be able to catch me at some

future time when I have grown much larger." But the man answered that he was not so silly as to throw away a little fish when he was not at all sure of catching him when he had got big.

A bird in the hand is worth two in the bush.

THE ASS IN THE LION'S SKIN

A DONKEY chanced one day to find the skin of a lion, and put it on. Then he went into the woods and fields and frightened all the flocks and herds. At last the donkey met his owner and tried to frighten him, too; but the man, noticing the long ears of the



donkey, at once recognised what animal he really was, and gave him a sound beating with a thick stick.

It is of no use to pretend to be greater or cleverer than we are.

THE WIND AND THE SUN

ONE day the north wind and the sun were having an argument as to which was the stronger, and they agreed to try their strength upon a traveller. The one that got the traveller's coat

off first was to be the winner. The north wind began, and blew a strong, cold blast, accompaned by a sharp, driving shower of rain. But instead of blowing the man's cloak off, it only made him hold it round his body all the more closely.

The sun's turn came next, and he began to shine as hot as possible upon the head of the poor weather-beaten traveller. The man grew faint with the heat and unable to bear it any longer, so he threw off his heavy cloak and took shelter in a neighbouring wood. Thus the sun was the winner.

Gentle persuasion often succeeds where force fails.

THE WOMAN AND THE EMPTY CASK

AN old woman saw an empty cask lying on the ground from which the wine had just been emptied. She put her nose to the bung-hole and sniffed for some time at the cask, which still smelt pleasantly of the wine. Then she

exclaimed: "Oh, what a delicious smell! How good the contents must have been when even the cask smells so nice!"

Good actions, like sweet wine, leave pleasant memories behind them.

AMY ROBSART

SORE and sad that lady grieved
In Cumnor Hall, so lone, so drear;
Full many a piercing scream was heard,
And many a cry of morbid fear.
The death-bell thrice was heard to ring,
An aerial voice was heard to call;
And thrice the raven flapped its wing
Around the tower of Cumnor Hall.

And in that manor now no more
Is cheerful feast and sprightly ball;
For ever since that dreary hour
Have spirits haunted Cumnor Hall.
The village maids, with fearful glance,
Avoid the ancient moss-grown wall;
Nor ever lead the sprightly dance
Among the grass of Cumnor Hall.

WHO was this lady who grieved in Cumnor Hall, and for whom "the death-bell thrice was heard to ring"? She was the daughter of a gentleman who owned great estates in Cornwall, a certain Sir John Robsart, a man of ancient family and great wealth. She was the heiress of this rich landowner, and rumour says that she was exquisitely lovely, a maiden fairer than any other of that age.

AMY ROBSART WAS THROWN DOWNSTAIRS

We can imagine how happy was the childhood of little Amy Robsart in the West Country. With a father who adored her, peasants who smiled to see the little lady pass, and a home beautiful, comfortable, and prosperous, life must have seemed to her a gift expressly made for her enjoyment. And later her happiness must have been greater still. For there came to visit her, and to make love to her, one of the most striking men who ever walked the earth. This was a certain Lord Robert Dudley, a youth so handsome and so gracious in manner that he was reckoned the Apollo of that age. He was tall, strongly but gracefully formed, with a countenance that might have been chiselled, so fine were the features, so delicate the lines. And instead of having his conversation filled with foxes and horses and dogs and stuff of the stable, he had the soul of a poet for lovely scenery, and the soul of an artist for splendid buildings.

This youth had been sent to Cornwall by his father, an ambitious man, who had arranged with Sir John Robsart that his handsome son should marry the daughter of the rich knight.

After a delightful courtship, and while they were still little more than children, on June 4, 1550, at the palace of Sheen, with King Edward VI. present at the brilliant ceremony, Amy Robsart was married to Lord Robert Dudley.

For ten years they lived together, happily at first, but soon with a gradually increasing unrest. Amy came to see that her handsome boy husband was consumed by one overmastering passion—the passion of ambition. He could not be happy with home life. He wanted to be a figure at court—to outshine all others. He wanted to be a power in the state.

Edward VI. was dead, and the wonderful Elizabeth reigned over England. Lord Robert Dudley pleased that fastidious great lady. She kept him constantly at her side. She showered royal favours upon him. He became the chief jewel of her gorgeous court, and nothing seemed beyond the aspirations of the handsome young courtier. And what became of Amy? She was sent by her husband to Cumnor Hall,

near Oxford. This was the residence of a gentleman named Anthony Foster, who was fond of music and gardening, and said to be a worthy and sagacious man. He was something more. He was in the pay of Lord Robert Dudley.

One night, when a man named Sir Richard Varney, also in the pay of Lord Robert Dudley, was alone with his servant in Cumnor Hall, the chamber door of Amy Robsart was burst open, she was strangled, knocked about the head, and thrown down a flight of stairs. The next day the story was told that Lord Dudley's wife had fallen down a flight of steps, and broken her neck.

Such is the sad story of poor Amy Robsart, the heroine of Sir Walter Scott's romance "Kenilworth." But it is doubted by some learned men whether Lord Leicester, as her husband became, was really guilty of her murder. The proofs are not clear. The history is very obscure. Lord Burleigh certainly declared against Queen Elizabeth's marriage to Lord Leicester, when she thought of making him her husband, because that nobleman was "infamed by the death of his wife." The death of Amy Robsart was, of course, a considerable scandal at that time; and many people thought that her ambitious husband would be glad to get rid of her.

But Lord Robert Dudley may have been innocent. His friends and dependants, hoping to advance themselves by his increasing glory, may themselves have contrived the diabolical act. "With his wife out of the way," they may have argued, "he will marry the queen, and we shall all be great men." The murder of Amy Robsart, so far as her husband is concerned, remains one of the mysteries that will probably never be solved.

LES OIES QUI GARDAIENT ROME

THE ENGLISH VERSION OF THIS STORY IS GIVEN ON PAGE 554

Rome était assiégée. Un terrible et nouvel ennemi l'attaquait. Ces hommes venaient du Nord. Ils étaient grands et sauvages, avaient des yeux bleus perçants et de longs cheveux d'or qui brillaient. Ils s'appelaient les Gaulois.

Des batailles sanglantes furent livrées dans la ville et les légions romaines se virent repoussées sans cesse. Les Gaulois étaient non seulement forts, mais audacieux. Ils se jetaient sur les Romains en poussant des cris terribles et déchiraient leurs rangs.

Les pauvres Romains furent finalement obligés de se retirer dans leur dernière forteresse, appelée le Capitole. Ils s'y trouvaient en sûreté, car qui aurait jamais songé à escalader le roc à pic pour franchir les murs puissants du Capitole? Mais c'était terrible et triste pour les soldats romains, bien qu'ils fûssent en sûreté, de voir du haut des murs du fort, les sauvages Gaulois brûlant leurs maisons et s'emparant de tout ce qu'ils possédaient de précieux comme butin.

Les Romains bientôt eurent affreusement faim. Plus d'une fois, ils durent regarder les oies sacrées qui vivaient dans le temple de Junon, en se disant que ce ne serait pas un crime de les tuer pour les manger.

Mais les oies étaient sacrées aux Romains. Les tuer eût été un sacrilège.

Il arriva, une nuit, tandis qu'un jeune Romain, nommé Manlius, était endormi près de son épée non loin du temple de Junon, qu'un bruit étrange troubla ses rêves, l'éveilla subitement et lui fit saisir son épée en se levant rapidement.

Il reconnut le bruit aussitôt. C'était le cri des oies sacrées. Qu'est-ce qui avait réveillé ces oiseaux?

Le bruit augmenta, et devint bientôt une rumeur d'alarme et de panique; tout le troupeau d'oies remplissait la nuit de ses cris de frayeur.

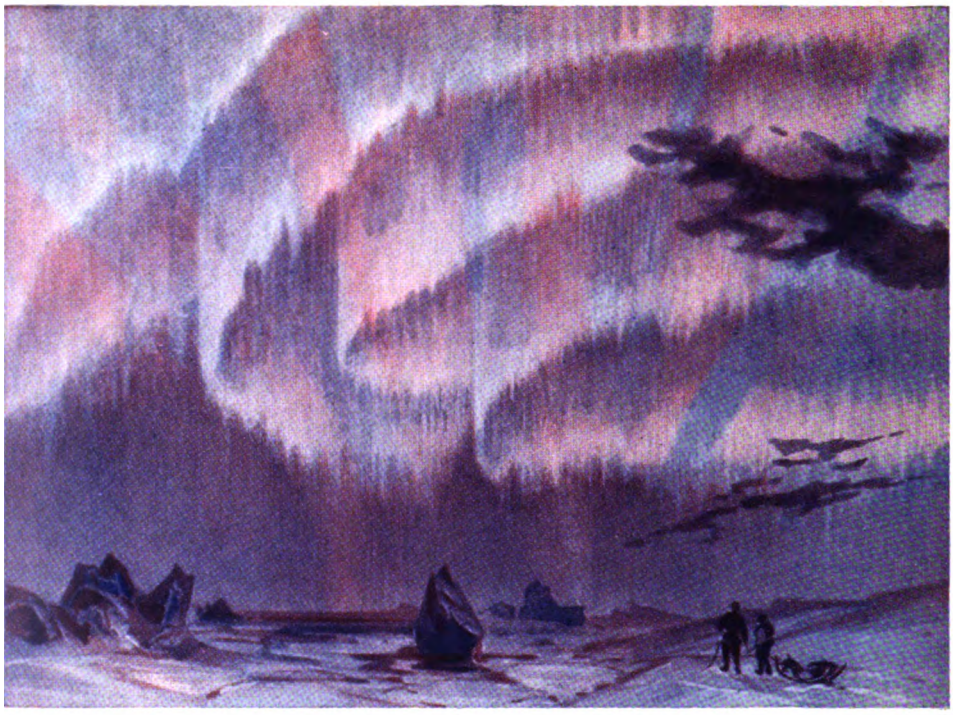
Manlius courut aux murs du fort et se pencha. Il se trouva en face d'un Gaulois!

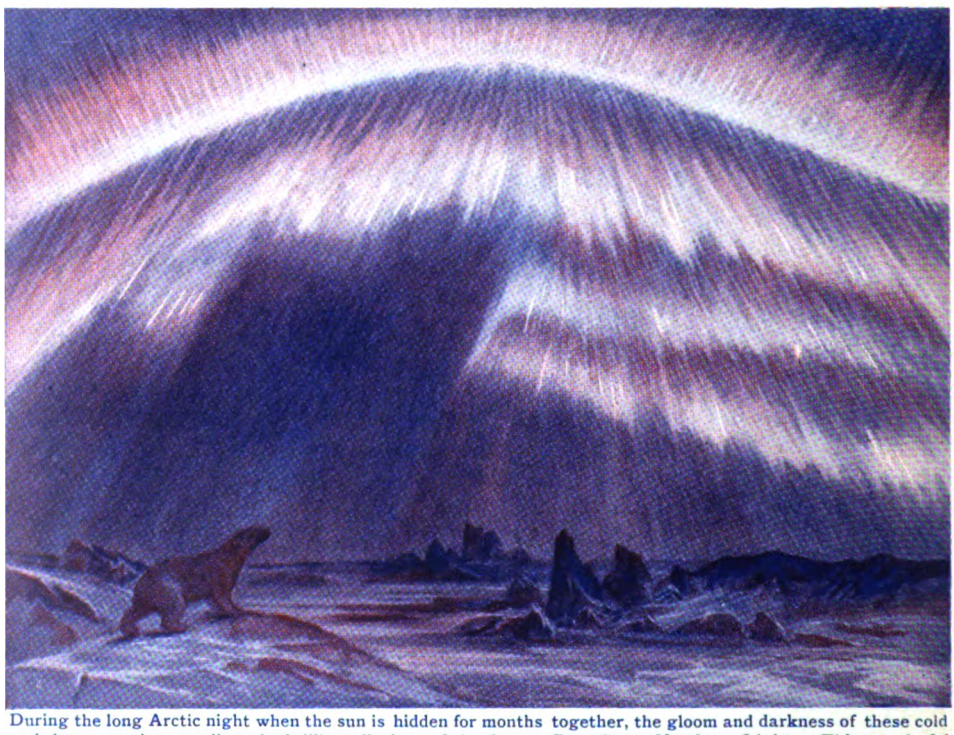
Le chef des Gaulois avait conduit ses hommes à l'assaut pour une attaque nocturne et il allait se hisser par dessus le mur quand Manlius apparut. Manlius aussitôt saisit les poignets tendus du Gaulois, arracha ses doigts du parapet et lança son ennemi à bas de la colline.

Le crit d'alarme des oies devint de plus en plus perçant. Des Romains furent éveillés en sursaut, et, saisissant leurs armes, ils se hâtèrent d'aller voir ce qui se passait. Ils trouvèrent Manlius qui défendait les murs. Avec un cri de victoire, ils s'élancèrent à son secours et en quelques minutes, toute la garnison fût éveillée; les Gaulois furent repoussés et complètement battus.

THE NEXT STORIES ARE ON PAGE 4001

THE GLORY OF THE NORTHERN LIGHTS





During the long Arctic night when the sun is hidden for months together, the gloom and darkness of these cold and dreary regions are lit up by brilliant displays of the Aurora Borealis, or Northern Lights. This wonderful exhibition of light and colour, one of the most magnificent electrical displays in all Nature, takes various forms. of which two are shown in these pictures.